COAL AGE

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The nature of some of our recent correspondence causes us to use this page to clear up a point or two. It concerns the policy of Coal Age.

There has never been the slightest deviation from a settled editorial aim since the birth of the paper. One word covers our entire plan of procedure—Justice—to all, from miner to owner; at the same time not forgetting the rights of the fuel consumer, who, in the final analysis, is a most important party in our industry's struggle for commercial success.

In line with this idea, we hold that the pages of Coal Age are open to every responsible person who has any interest, directly or indirectly, in the production of coal.

We insist that the paper itself, its owners and editors, be held responsible only for their editorial views. We are opposed to the establishment of a rigorous censorship to pass on the acceptability of matter submitted, only reserving the right to determine that articles and letters sent us for publication are sensible and truthful.

The ideas of the contributors need not conform to the beliefs of the editors, any more than they must coincide with the views of other individuals in the industry. We have published innumerable articles by responsible men, whose statements were opposed to our own conception of the subject in hand.

If you read a biography in the Who's Who columns of Coal Age that covers the life and work of some fellow you dislike, don't hold a grudge against the paper. Maybe, in some ways, we don't like him any better than you do.

Or, if John Henry, superintendent of the "Snow White" mine, expresses views on the liquor problem, the labor question, miners' education, or ventilation, which do not agree with your own opinions, please remember that John Henry is no kin of ours, and we are not responsible for his ideas. Lock yourself in a sound-proof room and cuss him to your heart's content, but refrain from directing your remarks at us.

The coal industry is a business that has nothing to hide. It will profit by having the confidence of the entire population. A journal devoted entirely to the interests of the operators, or one printed solely for the miners, must needs be prejudiced, and such a paper will have small influence with the outsider when its voice is raised in time of real distress.

Nor can a journal conducted in the interests of one class in any business observe and obey the great truth that whatever course of action will benefit the whole people of the United States, will eventually benefit all those who gain their livelihood in any one of our great basic industries.

We prefer the solid approval of a few to the empty praise of many. As for criticism, it is the sure sign of accomplishment. The proof of justice does not always lie in the voice of the majority. The paper that buys popularity at the sacrifice of honor and truth pays too dear a price.

Surely, now, our position is plain. Coal Age is an open forum where every responsible coal man may express his honest opinion. If you fail to refute a statement that seems in error when the privilege is yours, certainly you should not strike from ambush at the fellow who stands in the open and invites your attack.

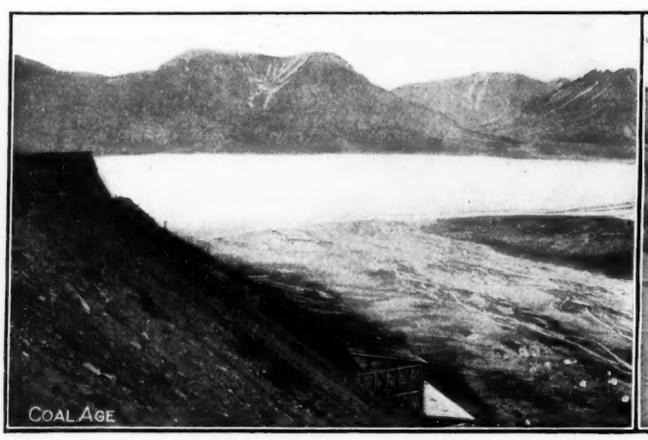
This paper has doubled the effectiveness of its educational campaign through its course of independent action. No effort has been made to create a masterpiece of literary art. We want to be correct; we have been human, and we intend always to be fair. We aim to do, not what we may, but what we ought, and we shall never plead a cause where our pen will be confuted by our conscience.

American Coal Mining at 80 Degrees North

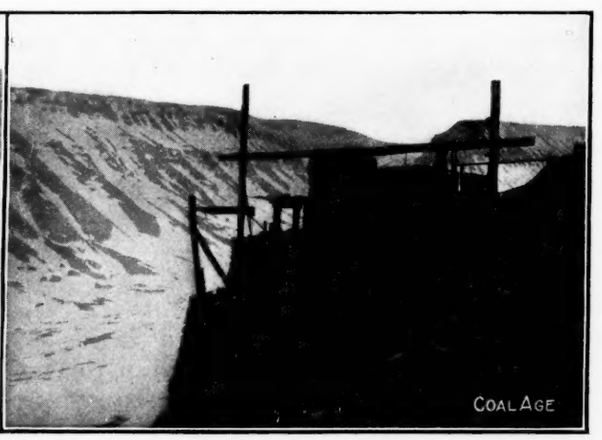
By C. A. Tupper*

SYNOPSIS—Describes the most northerly mining operation in the world. The miners are paid from $1.35 to $1.90 per day. Living expenses average about 41c. per day. Even in midsummer, the temperature rises but little above the freezing mark.

Recent agitation on the part of English, Norwegian and Russian interests for an international commission to fix the status of property rights in Spitzbergen and provide for some governmental regulation of its affairs, calls the attention of the mining public to a district hitherto generally regarded as beyond the bounds of commercial exploitation. There has, for some years past, been much talk of mining in the Arctic regions, including southern Greenland; but, outside of Alaska and the Scandinavian peninsula, where conditions are comparatively favorable, it has remained for an American concern, known as the Arctic Coal Co., to give the first demonstration of what can be done in a region that is literally ice-bound and only accessible for a small part of the year.



Mouth of Adit with Loading Pockets Below



Coal Pockets Were Constructed from Hillside Stone

Spitzbergen, the "No-Man's-Land," which does not fly the flag of any country and, until quite recently, was considered unworthy of notice, is an archipelago lying between 76 and 80 deg. north latitude and due north of Norway, or about midway from Greenland to Nova Zembla. It comprises the five large islands of West Spitzbergen or New Friesland, Northeast Land, Edge Island, Barents Island and Prince Charles Foreland, as well as the Wiche and many other small islands. The chief island of the group, West Spitzbergen, which has an area of 15,200 square miles, is shaped like a wedge pointed south and deeply indented on the west and north by long branching fjords, one of which is known as Advent Bay. Here, in 1900, coal began to be worked, for sale to whaling steamers, a seam 10 ft. thick being found below 40 ft. of fossil ice and 20 ft. of limestone.

The backbone of the island consists of a mass of pre-Devonian granites, gneisses and schists. Resting upon these there is a succession of sedimentary rocks, lying nearly horizontal, among which the Carboniferous period is well represented, and the developments at Advent Bay may be considered as only the beginning of similar operations in the future.

Coal Sells for about $5 per Ton

The coal found in Spitzbergen is of good quality. It averages, for the deposit mentioned, not more than 2 per cent. of red ash and is free from slate, burning freely in an open grate fire. The prices obtained for the coal are good. At last reports it was bringing 19 to 20 kroner in Trondhjem or Narvik, on the Norwegian coast, equivalent to $5.13 to $5.40 per ton, and for direct sale to the whalers entering Advent Bay the price charged was 14 kroner, or $3.78 per ton. These amounts, however, are moderate in comparison with the prices heretofore asked for English coal in the Arctic regions. At Hammerfest, for example, a ton of the latter has seldom been obtainable at less than 26 kroner, or $7.02.

The Arctic Coal Co., whose headquarters are in Boston, Mass., has staked out at Advent Bay a coal field nearly four miles long. Exploration with steamers and landing parties also resulted in the discovery of a good coal bed in Saxon Bay, at an elevation of about 400 ft. above sea level and another at Cape Bojan. The latter is of excellent quality, but the shore has a heavy surf which will make loading to vessels difficult. At Green Harbor the company has taken over an existing property, formerly used as a spasmodic source of supply by whalers, who maintain a station there for trying out blubber, and this yields a good, hard steam coal which can be readily recovered and transported to vessels by some such method as that described below. Thus the prospects for more extended operations in the future are excellent.

Coal from the present mine at Advent Bay, where the operations in general are along the lines of modern colliery practice, is brought to the surface through an adit,

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the mouth of which lies about 600 ft. above sea level and at a distance of fully 4300 ft. from the nearest point where vessels can be moored. The primary condition was the rapid and, so far as possible, automatic loading of the ships after arrival, in order that the maximum number of round trips might be made during the short summer months. The sea around the island is shallow and ice readily accumulates on its shores, with great glaciers pushing down from the mountainous interior. Although these glaciers do not give rise to icebergs as huge as those of Greenland, the smaller bergs and the pack ice are thick enough to prevent access to Advent Bay except for a relatively brief period, and even this would be hazardous except for the warm drift from the Atlantic, which tends to moderate the climate of Spitzbergen and leave an open passage for vessels to approach the coast in summer.

Spitzbergen Has No Native Population

Another requisite, under these conditions, was to concentrate labor upon actual mining and to avoid the use of many hands for anything connected with conveying the coal from the mouth of the mine and loading it upon steamers. Spitzbergen has no native or otherwise permanent population, and every workman has to be brought from the mainland of Europe at considerable expense. This consideration, therefore, eliminated the project first proposed, of running a gravity road to the shore, dumping to a storage plant there and conveying the coal in lighters to ships lying at anchor in deep water outside the surf, even apart from the slow loading which this would involve. It was practicable but not very profitable.

The logical solution was an aërial tramway from the mouth of the adit to a ship-loading station at the sea.

In the accompanying reproductions of photographs, the system constructed is clearly illustrated. As the coal from the mine reaches the adit mouth, it is dumped to a storage plant built on the hillside in the form of a silo, which is provided with chutes for the automatic loading of the buckets attached to the ropeway carriages. Here, during the loading of a ship, only two workmen are required, one for placing the empty buckets in position for filling and the other for operating the bin gates. Arriving in the ship-loading station at sea, the buckets are tripped and automatically dumped to a hopper, when they are discharged into one of the holds of the vessel through an adjustable telescopic spout.

At this point two men also suffice, the duty of the one being to guide the carriages around the return loop and of the second to see that the loading spout is in proper position. As the loads are small and follow each other in quick succession, the amount of labor involved on the vessel itself in properly distributing the cargo is slight, and the crew of the ship can readily take care of both this and the work above referred to, including that at the adit mouth if required.

As soon as the vessel is loaded fore and aft, a bell signal is given to the loading plant at the mouth of the mine, so that the operation of the aërial line will be suspended until the ship can take up a new position. This is easily effected by ropes and windlass, and the telescopic spout is shifted by means of a small slewing crane. By the system described a steamer can be loaded in 6 to 12 hours, according to its carrying capacity.

The saving in time which it effects is graphically shown on the other side of the bay where an English corporation has opened what are known as the Fangen Mines. There the coal is brought down a distance of only 650 ft., but by means of an ordinary incline, and is then dumped into lighters, which carry it through the surf to the steamers anchored in deep water, where it must be handled by cranes and manual labor. With these means it takes several days for even the smaller loads.

In the construction and operation of the aërial line, which was designed and built by Adolf Bleichert & Co., of London and Leipsic, there are many features of suggestive value for similar conditions elsewhere.

The Tramway Is Self-Operating

The longitudinal profile shows a line with heavy down grade from the mouth of the adit to the loading station at the sea, which is built on pile work. Owing to the fall, the line, of course, requires no driving mechanism. On the contrary, an excess of power is developed which must be braked. For this purpose a brake regulator from the firm J. Schrieder, Saeckingen-am-Rhein, Germany, is installed in the mine loading plant. This consists essentially of a rotary pump with a balanced sliding throttle

Bringing in Tramway Material from Sea, over Pack Ice

valve, which is driven by a belt from the countershaft. The pump draws in oil or soap water from a reservoir in the box foundation and forces it back into the latter through the apertures of the adjusting slide. The latter is actuated by a centrifugal governor on the driving shaft of the tramway. As soon as the number of revolutions of this shaft reaches a predetermined limit, owing to the excessive loading of the down line, the governor closes the valve proportionately and retards the action of the rotary pump, which thus acts on the shaft as a powerful brake. The position of the regulating mechanism is shown in the illustrations.

The details of loading at the mine are also to be plainly seen from the cuts. At the left-hand upper of one of these the adit mouth will be seen, with a slide leading to the coal pockets at the beginning of the aërial tramway. The coal is here shunted by hand to the various pockets. These pockets terminate in lock chutes, before which the loading track of the tramway is laid. A short rail siding is also provided for any carriers not needed in the operations. The carriages, with their buckets as loaded,

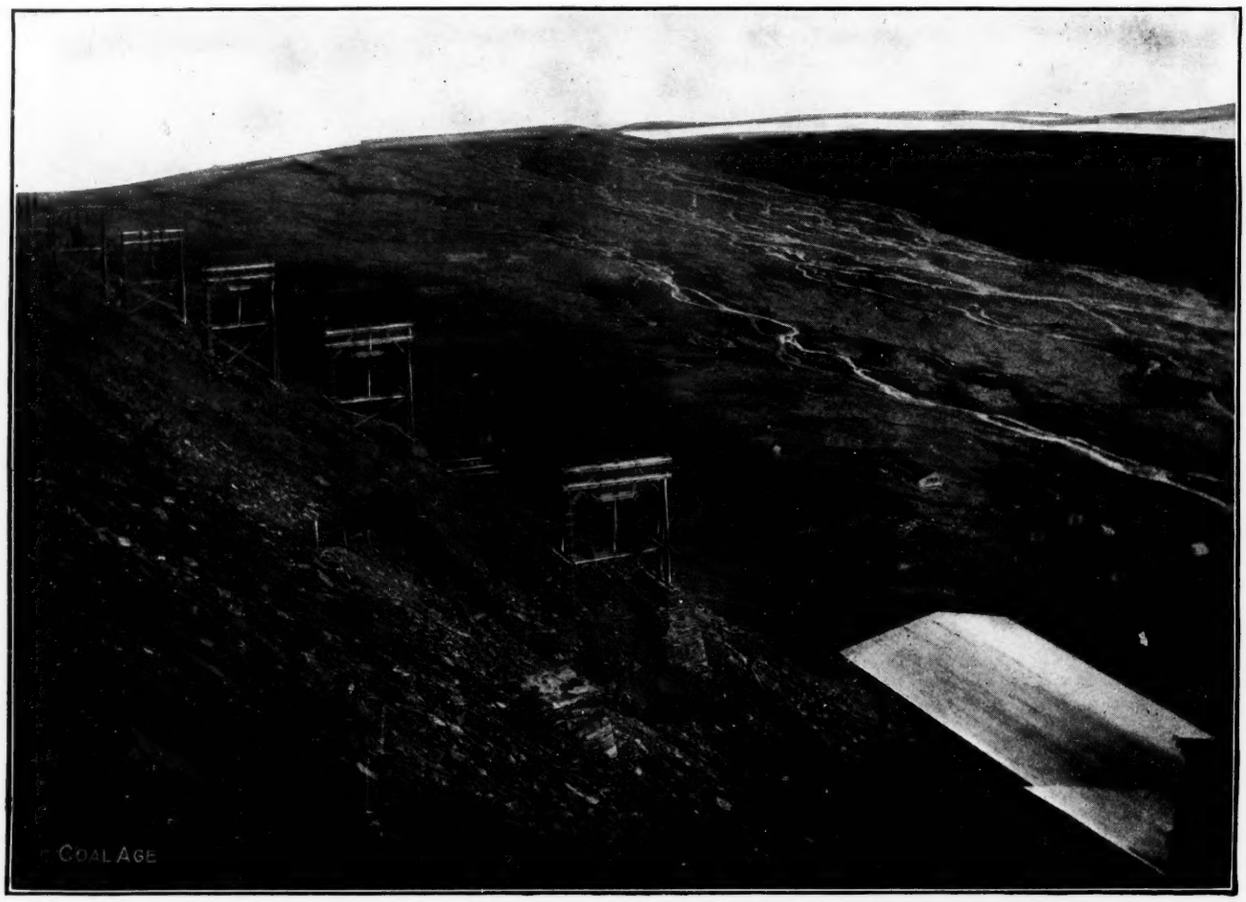
are pushed by hand over the end return loop or over the intermediate switch to the station exit, where they couple automatically to the constantly moving traction rope.

The line has a length of about 4400 ft., runs over 15 timber supports and will carry daily 1000 tons or more, according to the capacity of the ship to be filled.

into vessel chutes. Eventually more coal pockets will be built at the mouth of the mine.

Outside Work Is Suspended during Winter Months

In the erection of the tramway there were great difficulties to be overcome, as a result of the climate and the nature of the country. Unfavorable ice conditions, when



Start of the Aërial Tramway, Showing Miners' Houses in Valley Below

The unloading station at the sea, as revealed by the illustrations, consists primarily of piles driven to bed rock at a considerable depth and carrying a platform on which an end return sheave is fitted. The aërial carriages uncouple automatically on arrival and dump to the hopper, being then pushed around the loop to a point where they again grip the traction rope and are whirled away upward. A narrow gangway connects the station to the shore; but between the last support and the station at sea there is a clear span of over 800 ft. The shore terminus is reinforced by rubbish dumped around the last land support, and this is being extended outward, so that in time the length of span over the water can be decreased if found desirable.

The silo-like storage plant at the mouth of the mine cannot take all the coal mined during the winter, and, aside from what can be conveniently held underground until vessels are loading, a coal dump is provided on the shore by dumping from the open line of the tramway. In order to take coal from this dump during the summer months, a temporary track is run on piles to the ship-loading station, where the cars are tipped by hand

the work was commenced, prevented any approach directly to Advent Bay until the summer season was far advanced, thus necessitating transportation of material many miles over treacherous pack-ice. The ground, which is frozen even in the warmest months, caused further trouble, as all excavations for the supports of the tramway had to be blasted out. Under these conditions, the end of the third summer had arrived before the line was completed. During the winters, operations had to be entirely suspended above ground, although the mine itself continued to be worked.

In the building of the loading station at the mouth of the mine some of the most disheartening obstacles were encountered. The steep incline of the hill was thickly covered with sandstone boulders, like much of the glacial drift of arctic America, and these were cemented by masses of ice. Before blasting for the foundation itself could be commenced, this frozen strata, many feet thick, had to be removed. Then the small rocks were collected, shaped and used as building material, for bringing in brick from Europe would have been expensive; and the resulting structure, although of irregular, unat-

tractive appearance, is much better suited to withstand the rigors of the climate. In using a mortar binder, it was necessary not only to keep this at a proper temperature, but also to heat the rocks themselves. During the warmest period the atmosphere on Spitzbergen rises only slightly above freezing point under the direct rays of the sun, and everything immediately congeals again in the shade. The building material and parts for the tramway were raised over an incline by means of ropes and winches.

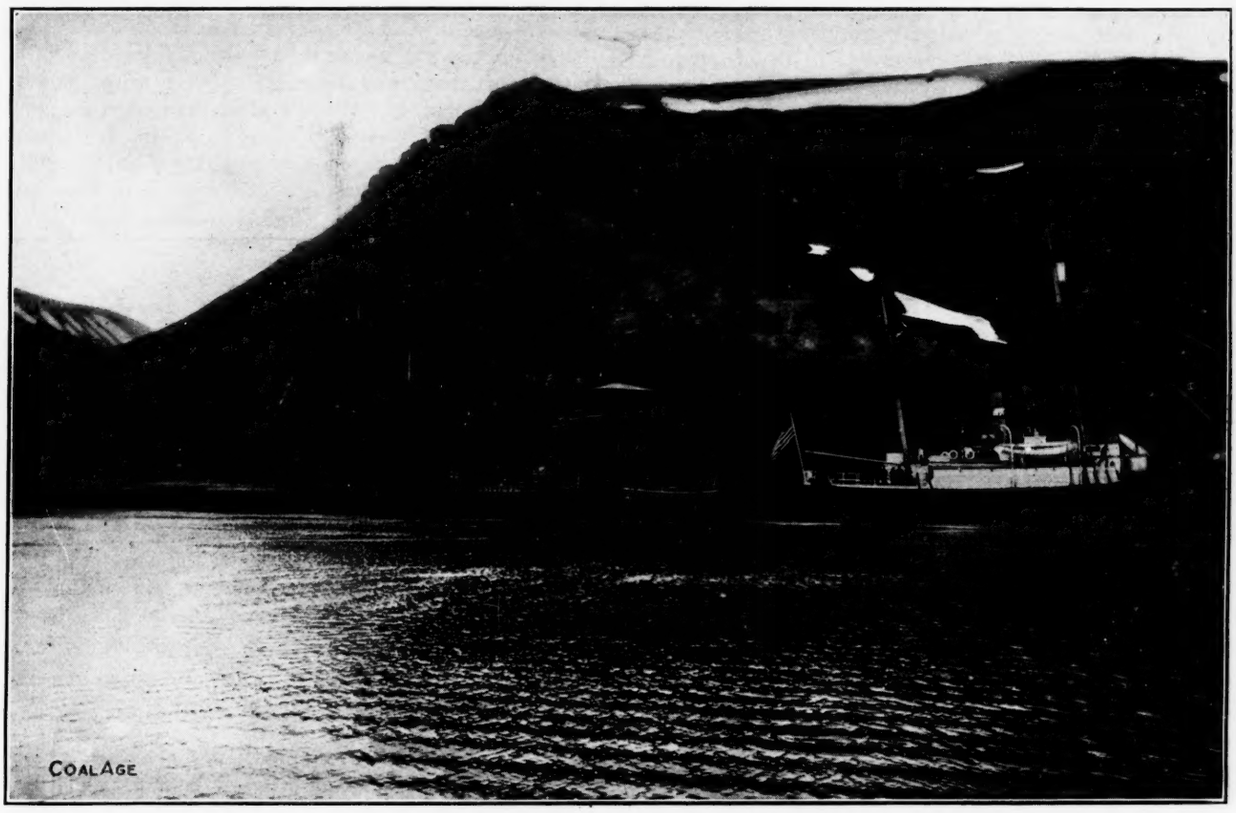
The construction of the aërial tramway, in its various details, was of a character to suit the severe climatic conditions as well as the capacity and duty which would be required of such a line in an ordinary colliery district of the United States or Europe. The track cables used are of the "locked-coil" cable type, so named from the fact that the outer wires, which are drawn to shape, interlock one with another. The smooth surface thus obtained results in a uniform distribution of wear which not only lengthens the life of the cable itself, but also of the carriage wheels that run on it. To keep the track cables coated with oil or compound there is a special traveling oiler. This consists of carriage underhung by a receptacle in which there is an oil tank and a small pump. The latter is so connected to the moving wheels of the carriage that it is kept constantly in operation and sends a light spray between them onto the carrying cable.

The traction cable is of equally good quality and strength for the operating requirements. It is made of strands coiled about a hemp core in the usual way, each strand being composed of steel wires. Both are twisted in the same relative direction, which differs from the usual practice. For coating the traction rope there is another ingenious device. This is a U-shaped receptacle containing the compound, which is suspended near the upper terminal sheave. The cable passes first over a small roller in this receptacle, which in revolving slushes it with the coating material, and then between brushes placed a little farther along, which wipe off the drip.

Arrangements for anchoring and applying tension to the cables are in accordance with usual engineering practice for lines of this kind. In tightening the cables, however, chains have not been used, as they are apt to snap in the severe cold of Spitzbergen, but the tension weights are hung by steel-strand cable of special make. All cable lengths are fastened together by a patent coupling originated by the tramway builders.

Each carriage consists of two steel side plates, between which are mounted two cast-steel wheels fitted with phosphor-bronze pins, so designed that, as the upper surfaces become worn, they can be turned underside up. The hanger pins are of machinery steel. In order to provide carriage grips which would adapt themselves to varying cable diameters due to wear, as well as to changes in grade, the carriers were provided with what are known as "Automat" couplings, with underhung grips, which operate automatically. These hold the loads securely in vertical position at any grade and are self-adjusting to variations in cable thickness. For the track or carrying cables, there are also special shoes which prevent springing. For these there have been provided steel hoods, with hinges, that cover the cable on both sides of the shoe or saddle and protect it from undue wear.

Care was taken in the erection to have the terminal



END OF AËRIAL TRAMWAY AND STEAMSHIP PRIOR TO LOADING

rails at the loading and unloading station, as well as the intermediate saddles, exactly in line with the track cables, so that there is no jar or reaction as the loads enter or leave.

The Supporting Towers

The supporting towers are built of logs and roughhewn timbers of Norway pine, and the entire construction is as simple and inexpensive as it could be made, consistent with strength and operating economy. Not only is the plant the most northerly of its kind in the world, but it is also a good example of how mineral deposits inaccessible to transport by ordinary means, *whether on a coast difficult of approach or in badly broken or mountainous country,* can be brought to a stage of profitable development by a simple system of delivery to a loading point.

While abroad not long ago, I saw many aërial tramways, which are far more extensively utilized in Europe and in European colonies than in the United States, Canada or Mexico. The system above described has, however, been introduced to some extent in this country by a company now forming part of the American Steel & Wire Co., the present American licensees. Other successful aërial systems are those of the Broderick & Bascom Rope Co., A. Leschen & Sons Rope Co., John A. Roebling's Sons Co., the Painter Tramway Co., Macomber & Whyte, the Riblet Tramway Co. and the Vulcan Iron Works.

It was stated to me, while in northern Europe, that many attempts had been made to get at the mineral riches of Spitzbergen, but that the Arctic Coal Co. was the first to undertake the work on a proper financial basis and with adequate equipment of a permanent character. Operations are divided into two parts, the summer and the winter campaigns. For the former, which lasts from the beginning of June until the middle of September, about 200 men come from Norway to Advent Bay in the company's steamer "Munroe." During the winter months only half the force remains. They work 9¾ hours per day and live in company houses, having quarters for from 8 to 20 men each. These houses are built of heavy boards, fourfold, with thick building paper between all boards; and, with the additional heat insulation provided by the snow and ice on the outside in winter, the men are kept very warm and comfortable.

Wages paid are 6 to 7 kroner for miners and other skilled laborers, 5 kroner for muckers, trammers and laborers generally, and higher-grade employees in proportion. From these amounts, 1½ kroner per day is deducted for board and lodging; so that, with good behavior, each man has at the end of the season an ample surplus to carry back to Norway. Except for whalers caught in the ice, the employees of the Arctic Coal Co. were the first to winter in Spitzbergen, and they may, therefore, be regarded as pioneers in the settlement and systematic development of the islands.

The System of Mining in the Pocahontas Region

By W. H. Grady*

SYNOPSIS—The breakline or line of fracture should be kept straight and should not exceed 2400 ft. in length. In order that the pillar-slices may all be exactly of the same size, the crosscuts are laid out methodically so as to come where pockets would normally be driven in retreating with the pillar. Careful work in new mines results in a recovery of 95 per cent. of the coal.

I have had occasion to examine mines which produced during 1912 an aggregate of about 15,000,000 tons of coal. The conditions in which this coal was found admitted of the use of all the different methods of opening a property and the seams and overlying and underlying strata varied in their character so as to give, in some cases, the best and in others the most unfavorable conditions. Though the observations were all made east of the Ohio and Mississippi Rivers, the principles I shall advocate are applicable anywhere to room-and-pillar work.

It is a bad practice to drive up a room and allow the pillars to stand in the expectation of drawing them later. A better method is to start to "stump off" the pillars as soon as the room is completed by cutting across the rib as at *A*, in Fig. 1. The track should be laid so that cars can be placed conveniently for loading out both the coal in the cut and also that mined when the stump is drawn back.

Driving "Pockets" in Pillars

In this method, the miner is always protected by solid coal and the losses are reduced to a minimum. Room No. 6 shows the pillar and the heading stumps completely removed; room No. 5, a pocket just starting in; room No. 4, a pocket finished and a stump partly drawn back. Room No. 3 shows the pocket finished and work just starting on the stump; room No. 2 shows the pocket being driven, followed by a second pocket, which is only extended as far as a man can conveniently load the coal without a track turn, in order to avoid the necessity for frogs and switch points. Room No. 1 shows the pocket just starting.

The width of this pocket and the thickness of the stump depend largely on the nature of the roof and the mine equipment. With poor roof, which falls unexpectedly or within a few hours after the removal of the coal, the thickness of the stump should be such that a miner can reach all the coal safely and easily without venturing too far beyond the rib line of the pocket. If

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Note—Second part of article entitled "Some Details of Mining Methods with Special Reference to the Maximum of Recovery," read before the West Virginia Coal Mining Institute, Dec. 9, 1913. Two of the illustrations in this article appeared in a description of "Mining in the Pocahontas Field," by Audley H. Stow, Vol. 3, pp. 596 and 597, and we owe an apology to our readers for reproducing them. Because they are necessary to the text, which is in every way original and because they were received with approval at a leading institute and further because the method described is so worthy of general adoption, we venture to repeat them in this issue.

the roof is good and does not fall soon after the removal of the stump, the thickness of the small pillar may be increased and the number of track turns required per pillar may be reduced.

In the application of mining machines to the robbing of pillars, the distance between centers of pockets should be such that the thickness of stump left will form, under bad roof, one machine cut, or under good roof, two cuts of the machine.

How Slate Is Kept Out of Coal

The more common practice where the roof falls soon after the extraction of the stump, is to leave a small shell of coal to protect the miner from the gob and also to prevent him from loading fine slate into the car of coal. This results in a loss of coal that can be avoided at an expense for timber, which, under ordinary circumstances, is less than the value of that coal.

A practice which has been advocated and has proven

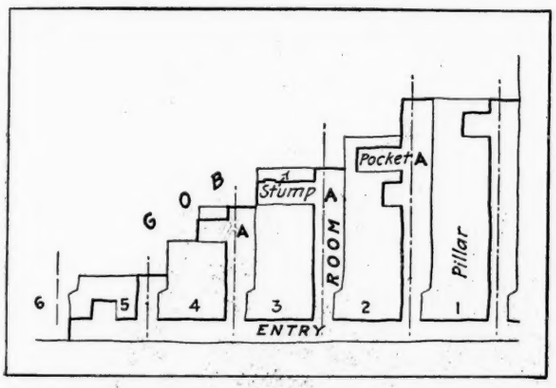


Fig. 1. The Pillars Are Repeatedly Split in Their Shortest Direction as at *A*, and the Narrow Stumps Removed on the Retreat

successful, is to place a row of props on the lower rib of the pocket, before the removal of the pillar stump has begun. When the next pocket to the outby is driven, it will be found that practically the entire stump may be loaded out without any admixture of gob and a greater percentage of lump coal will be obtained. This precautionary row of timbers is especially desirable where machines are used on the pillars.

I have noted that the roof over a robbing line exceeding 2400 ft. in length, sometimes begins to sag in the middle and renders the removal of the pillars in that immediate section difficult.

How the Fracture Line Is Kept Straight and the Recovery at a Maximum

The breakline should be kept as uniform as possible at all times. A method in practical every-day use, which is to be recommended is as shown in Fig. 2.

The engineers, as they take their monthly measurements, mark the pocket centers on the robbing rib of the room, and the foremen are required to drive their crosscuts on the line of a pocket as at *A*. The object in keeping the break line uniform is to insure against pillars extending back into the gob and acting as a fulcrum, or the knife-edge of a scale beam, upon which the roof teeters. This almost invariably causes additional timber expense and sometimes losses of coal, both of which could have been avoided had the break line been kept uniform.

Plan Suited to Needs in Development

Fig. 4 is the general plan of mining advocated by the Pocahontas Coal & Coke Co. The essential features of the plan of mining are: Provisions for tonnage during the development period; provisions for meeting the market demand; large barrier pillars insuring against squeezes and rendering impossible the destruction of coal over an extended area; four-entry system for all extensive main entries, using two as intakes and two as returns with breakthroughs between only at the points where the cross-entries turn off, rendering unnecessary the building of expensive masonry brattices every 80 ft. and insuring the maximum quantity of air for ventilation at a minimum cost for brattices and ventilating power; cross-entries with narrow chain pillars permitting the rapid advance of the entry.

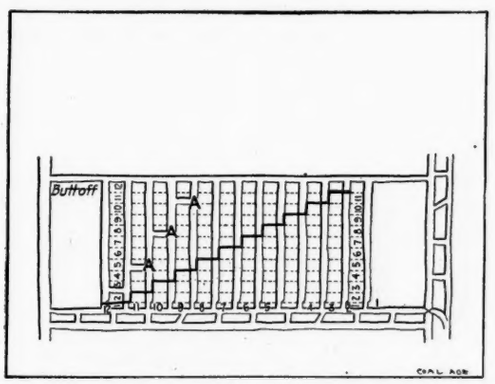


Fig. 2. Crosscuts Are Located at Carefully Chosen Distances as at *A*, so as Not to Interfere with Lifts from Pillar

In general all robbing must be done retreating with rooms driven after the entry is nearing completion, insuring against slate falls and rendering possible the extraction of all of the coal in one operation, thus combining first development and robbing.

Variations in Plan

The depth and number of rooms on an entry vary greatly at different mines, depending on local conditions of the seam; whether the haulage is by mule or gathering motor, whether the undercutting is performed by pick or machine, and not infrequently on the personal equation of the mine executive, for sometimes the manager of a plant will contend that he obtains the best results when he drives 25 rooms 500 ft. deep to the entry, and another manager working on an adjoining property under identically the same physical conditions and with the same type of equipment, not 1000 ft. away, will say that he gets the best results when his rooms do not exceed 300 ft. in depth and when there are only 15 rooms to the entry. The better policy is to encourage individual initiative and allow freely such modifications in any plan of mining as may be desired, provided that the modified plan embodies all the principles of modern methods and sound mining practice.

In the successful operation of any mine some general scheme of mining must be agreed upon, subscribed to by

all parties in any way concerned with the matter, including the land owner, if the property is a leased one. Then no omissions in, additions to, or deviations from that plan of mining should be permitted without the written consent of the lessee and lessor.

RECOVERY OF COAL IN MINES OF POCAHONTAS COAL & COKE CO.

Plant	Thickness of seam in feet	Acres of entry-mined	Acres of rooms mined	Acres of pillars mined	Total acres mined	Total tonnage mined	Tons mined per acre	Theoretical tons per acre	Percentage of recovery	Proportion of seam rejected
1	6.15	3.06	4.57	11.03	18.66	165,254	8,856	9,922	89.3	0.24
2	5.65	4.40	4.80	14.80	24.00	188,391	8,185	9,115	89.79	0.22
3	5.16	2.68	6.52	15.80	25.00	180,386	7,215	8,325	86.6	0.22
4	4.42	5.88	8.65	13.09	27.62	192,437	6,960	7,131	97.6	0.23
5	5.94	7.00	10.09	19.20	36.29	334,005	9,203	9,582	96.0	0.22
6	4.32	2.11	3.64	9.20	15.04	94,427	6,278	6,969	90.0	0.31
7	5.34	3.31	6.34	0.00	9.65	83,000	8,601	8,614	99.8	0.20
8	5.42	3.72	6.06	9.72	19.50	144,769	8,181	8,777	93.2	0.20
9	4.65	8.10	16.80	2.34	27.24	201,044	7,380	7,534	98.0	0.18
10	8.03	5.20	8.47	10.09	23.76	262,975	11,068	12,923	85.6	0.23

The Annual Balance Sheet

After the general plan of mining has been decided and operations begun, its success or failure will depend largely upon the degree of watchfulness exercised. The mine should be accurately surveyed and mapped at least once every 90 days. Frequent inspections should be made of the mine, minute attention being given to the condition of the working faces and the robbing line. At least once a year the theoretical yield of the property should be balanced against the actual tonnage delivered at the tipple. Accurate and complete records should be kept of the number of acres of entries, rooms and pillars driven each year and of both the percentage of recovery per acre and the state of exhaustion of the property.

That the above method of mining will yield the maximum of recovery is testified by the table above, the figures of which are typical of the results obtained by the Pocahontas Coal & Coke Co. in the Pocahontas field, and these, so far as I know, are not excelled anywhere. In this connection it should also be noted that the percentages of recovery are based on the total seam, including the portion rejected.

Recovery Lowered by Slipshod Work of Earlier Years

The lower percentages of recovery in the table result from the fact that in some instances, pillars are now being robbed that have been standing for many years. In the mines of the United States Coal & Coke Co., at and near Gary, W. Va., where all the work has been opened in recent years, the average percentage of recovery per acre since the beginning of operations, has been better than 95 per cent., and of the area mined, over one-third has been final mining. Digressing for the moment, if I may, from the main subject of this paper, I would say that perhaps nowhere is more thought being given to the subject of economical and safe mining than at the mines of the United States Coal & Coke Co. I have visited all the so called "model mines," including those of the anthracite field, for the express purpose of studying them, and it is a pleasure to be able to say that here in West Virginia, at Gary, by the untiring efforts of Edward O'Toole, general superintendent of the above company, a mining organization has been created which, for efficiency, is unsurpassed. Not only are the present methods of mining efficient, but the O'Toole combination, coal cutter, loader and transporting machine bids fair to revolutionize the present method of mining coal for coking purposes. Any one wishing to visit Gary is always welcome and the officers of the company will go to extremes in making your stay instructive and entertaining.

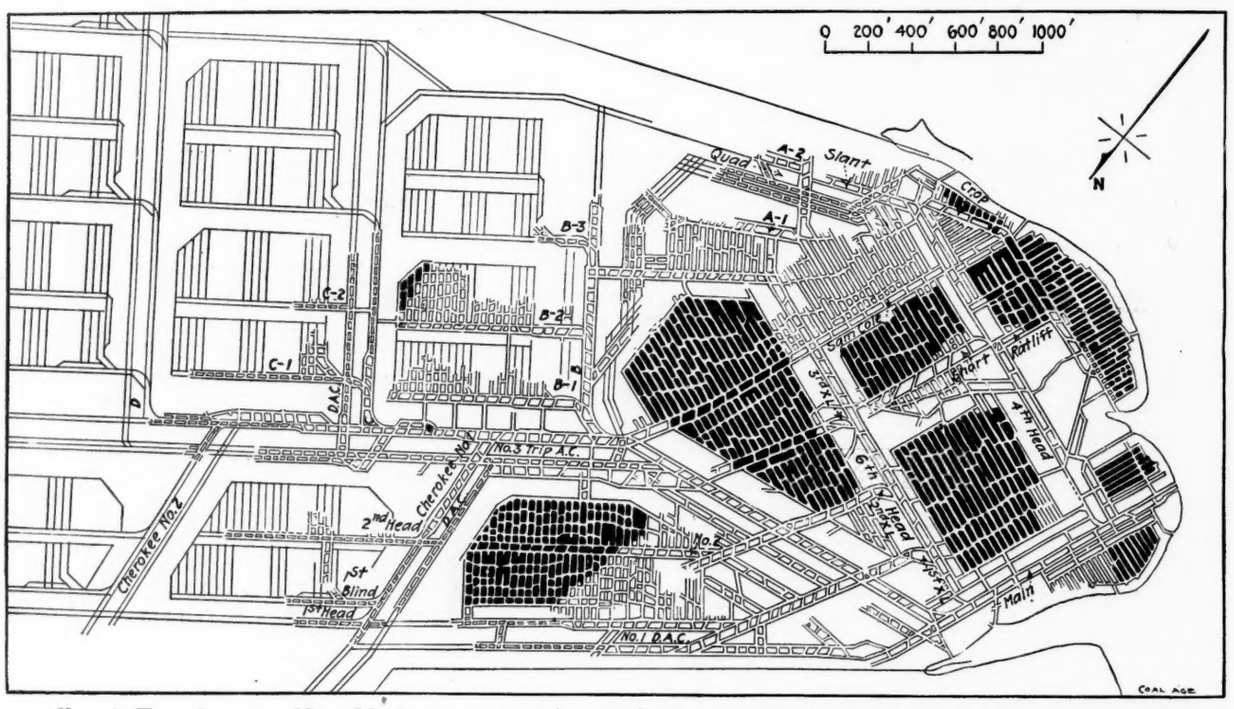


Fig. 3. The Old and New Methods at the Angle Colliery. The Former Are Illustrated by the Detailed Portion on the Right and the Latter in Skeleton Form on the Left

Cheaper Than Wasteful Methods

Returning to the main subject of the paper, I would say that the cost of production of room and entry coal by

this method is the same as in other methods of mining, while pillar coal is produced at less expense than is incurred in other methods.

In addition to the statement quoted all operating companies, I presume, have a statement showing the revenue derived from operations per ton of coal mined based on the net receipts from operations divided by the tonnage. By placing a value, which could be closely approximated, on the recoverable coal lost, and adding it to the net receipts a figure could be obtained showing what revenue would have been derived from the operations had the coal been mined without unnecessary waste. Dividing this by the tonnage a figure could be obtained for the statement which would show the profit that would have been derived per ton produced if the coal in the seam had been worked by the most conservative methods.

Bonding Value of a Well Managed Property

Statements of the above nature have a further value from a financial point of view for if it can be shown to a bonding concern that a property contains, let us say $500,000 worth of coal in the ground, 90 per cent. or more of which will be mined, it is certain that a greater asset value will be placed on the property than would be credited to it if the engineers of the bonding house report that under the methods of mining pursued, only 50 per cent. of the coal in the ground will be mined and the rest irretrievably lost.

In conclusion I desire to express thanks to all those who have in any way contributed to this paper, and especially to Thomas H. Clagett, chief engineer, Pocahontas Coal & Coke Co.; W. A. Phillips, general manager, Ashland Coal & Coke Co.; James Elwood Jones, general manager, Pocahontas Consolidated Collieries Co., Inc., for the use of the maps included in my paper.

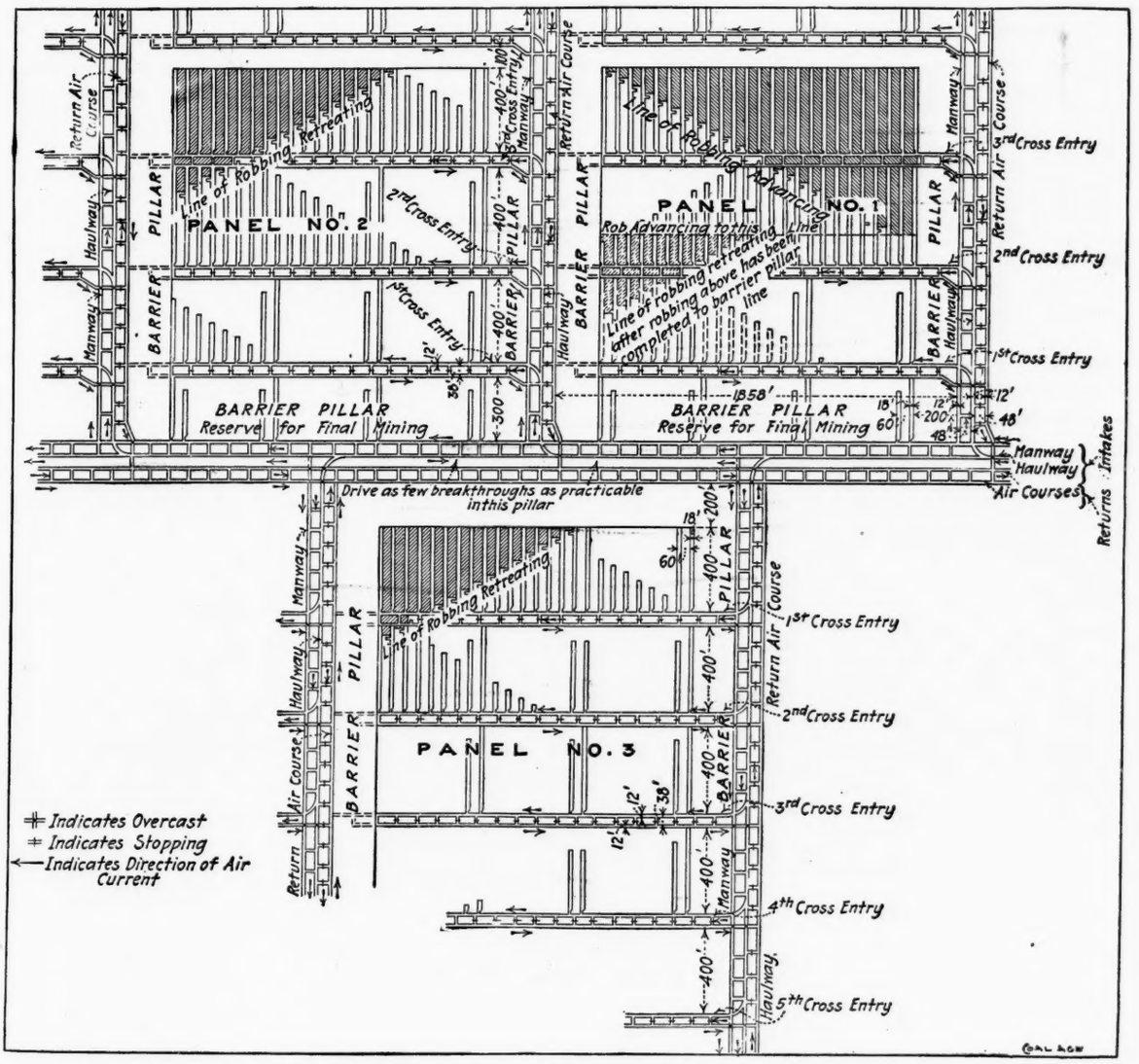


Fig. 4. General Plan of Mine Development of Pocahontas Coal & Coke Co.

A Prosperous Mining College

The short session for mining men at the College of Mines, University of Washington, Seattle, Wash., opened on Jan. 5 with a registration of 44 mining men from 10 states, Alaska, and five foreign countries. The course lasts three months and is arranged in sections for quartz, placer and coal miners.

Cementation in Shaft Sinking

SPECIAL CORRESPONDENCE

SYNOPSIS—A description of methods employed particularly in the north of France to exclude water effectually from shafts both during sinking and subsequently.

Considerable attention has been paid recently to methods involving the use of cement during shaft sinking in cases where the strata would otherwise present difficulties either mechanical or due to the infiltration of water both during sinking operations and subsequently.

At the International Congress at Liége, in 1905, the report of Monsieur Portier showed the excellent results obtained in the north of France by the cementation of water-bearing strata during the sinking of pit shafts.

Since then J. Lombois has described cementation methods of water-bearing territory, adopted by the Compagnie des Mines de Béthune in the bulletin of the Society of Mineral Industries, while later Monsieur Saclier has described in the Annales des Mines de France similar methods adopted by Edouard Agache in the sinking of shafts. These descriptions have called attention to the value of cementation methods, such as are now adopted extensively in France.

In these processes the operations succeed each other somewhat as follows: First, boreholes are sunk of sufficient number and proximity to each other to render the ground impermeable at the completion of the process. Then, thin cement grouting is injected into these holes either simultaneously in all of them or by sections, the third stage is the sinking of the shaft itself.

This method of operation which has been successful in the cretaceous area of the north of France is not necessarily applicable without modifications or extensions to other circumstances which are encountered in sinking operations. It has been found, for example, in the porous ground, such as the sandstone of the Vosges where there are a large number of small crevices that the penetration of the cement would not be sufficient for those pits much over 640 ft. in depth, the time taken by the various operations being too long. With these points in view, advances have been recently made in cementation methods which are worthy of attention.

WHERE NUMEROUS FISSURES ARE MET

Suppose that cement grouting is injected through one or more boreholes at a time in a stratum of ground containing numerous fissures. This condition is represented in Fig. 1 where *A* is a fissure of considerable width of opening, *B*, one which, although of considerable capacity, has a narrow neck or mouth to the borehole, *C* and *D* are fine cracks, while *F* is an extreme case of a capillary fissure.

The cement method to be entirely successful must adequately deal with all these types of fissures. It is, however, well known and always evident that all the grouting tends to enter the large openings, such as that at *A*, and during the time that it is penetrating these openings the pressure possible in the boreholes is not high. Furthermore, until considerable pressure is established, the cement will not enter into the more restricted crevices.

When the pressure increases somewhat, the cement is able to make enlargements in constricted fissures, such as *B*, but finally when the pressure has become high, say for example, 10 atmospheres, a considerable proportion of the fine fissures such as *B* and *D*, and also the capillary fissures *F* have become clogged at their entrances, and the cement grouting is unable to penetrate. In other words, during the period of low pressure, the grouting traveling down the boreholes deposits itself to a certain extent upon the walls and sides, with the result that when at last the higher pressure is attained the smaller openings are sealed.

When the duration of injection exceeds two hours from the first introduction of the cement, the inconvenience

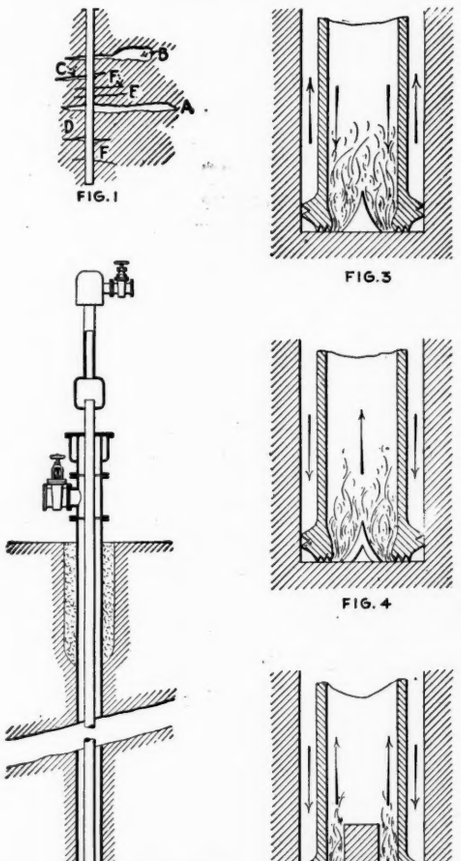


ILLUSTRATION OF BORING AND CEMENTATION CONDITIONS

becomes so great that the value of the method is questionable. To the well known fact that the injection of cement should be carried on under the highest pressure, the further statement may be added that this high pressure should be established in the boreholes as rapidly as possible. Otherwise the efficiency of the method will be reduced.

TREAT THE FISSURES INDIVIDUALLY

In order to obtain the high pressure quickly, it is essential that the grouting shall not at any one time en-

counter a large number of exits such as a number of fissures in its path. This leads logically, therefore, to the necessity for a method of cementation by which each fissure or small group of fissures is dealt with individually

It is known, of course, that in boring methods employing a current of water, the gage on the in-going pipe always indicates a certain pressure, which depends on the depth of the bore, the diameter of the rod and of the hole, and the volume of water being circulated. As soon as the bit upon the end of the boring-rod encounters a fissure in the earth, this pressure gage indicates a sharp variation, generally a drop. It then becomes advisable to inject into this fissure, cement grouting under a pressure of 10, 15, or even 20 atmospheres.

In order to do this, a certain distinction must be made between methods applicable to small holes or shallow depths and those which have great depths. As soon as

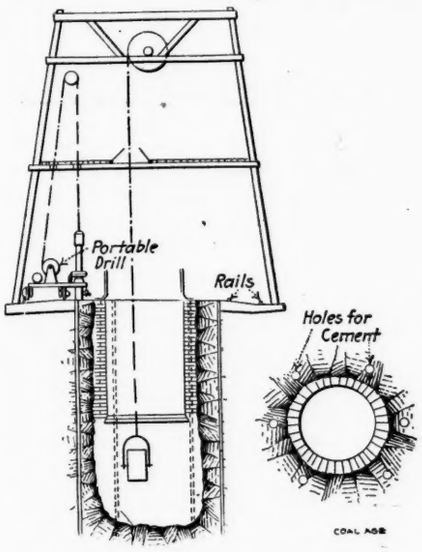


FIG. 6. ARRANGEMENT OF SINKING AND CEMENTATION APPARATUS

the bit touches the fissure indicated by the pressure gage, the rods are withdrawn, the boring apparatus removed to another hole, and there started to work, while in the meantime cement is brought to the first hole and there prepared for injection.

The grouting is forced into the interstices either by pump or compressed air, or by water under pressure as an intermediary. It is necessary also when following the above procedure that the apparatus for boring and cementation be light and transportable. It should be mentioned also that at small depths it is not usually possible to use high pressures, since under these circumstances communication between the fissures and the surface may be established.

THIS METHOD IMPRACTICABLE AT GREAT DEPTHS

If the depth is in excess of approximately 500 ft., this method of working becomes impracticable. In order to withdraw the 500 ft. of boring-rod, about half an hour would be required, and it would not be advantageous to perform this operation frequently. Moreover, a boring 6 in. in diameter, and 500 ft. deep, would have a capacity of 3¼ cu.yd. That is to say, in order to bring direct pressure upon the grout it would be necessary to handle 3¼ cu.yd. of material before the fissure would be placed under pressure.

This method, therefore, is too long. Furthermore, at the close of the operation there would be a considerable amount of cement in the hole. It is advantageous, therefore, in order to convey the cement to its destination in the least possible time to cause it to travel through a tube.

In practice, the tube is the boring-rod itself. The head of these rods and the head of the borehole are both closed by cocks or valves, in order to allow the passage into the boring of water or cement grouting, to control these liquids either as a direct or reversed current or even in both directions at the same time as explained later. Another object is to maintain in the borehole a pressure which can be regulated at will.

The two cocks disposed in this way are characteristic of the boring apparatus invented by J. V. Drejcha. They allow great rapidity in operation.

While it is true that the injection of cement through the boring-rod carries with it the easily seen danger of wedging the rod and the bit in the hole, if, during cementation, these parts are given a slow movement of rotation, this danger is much diminished.

A considerable number of operations carried out in the sandstone of the Vosges Mountains have shown that the earth exerts no elastic pressure upon the cement. That is to say, that the filled fissures do not give back their contents to the borehole when pressure upon the grout is removed.

A case or so to the contrary has, however, occurred, and the phenomenon has been attributed to the fissure being of such wide extent that the grouting under pressure raised the earth. When the pressure was withdrawn, the earth settled back, the cavity lost a certain amount of its volume, and a cement pat was ejected into the boring.

It is evident that in such a case it would be necessary to imprison the pressure in the hole at the close of the injection by closing both cocks, which would make impossible the withdrawal of the boring-rods. Consequently, the injection of cement through the boring-rod is not practicable where fissures have a tendency to return the cement grouting. Neither is this method applicable for a similar reason when the water encountered by the boring is of a spouting nature.

In such cases it becomes necessary to apply the first method as in borings of small depth. Practice shows, however, that in such cases since the volume of cement to be injected is large and the operation important, the relative inconvenience of removing a rod and filling the hole with grout is decreased. On the other hand, in the general case of fissures which do not return the cement, it is possible after the injection to continue boring which is in this way only slightly interrupted by the work of methodical cementation.

THE VARYING DENSITIES OF THE GROUT

As has been stated above, cement injection should be carried out rapidly. Now the density of cement grouting that can be employed may vary in practice from 3 per cent. to 20 per cent., according to the apertures of the fissures encountered. In continuously employing a 3 per cent. grouting, the operation takes an inconveniently long time; but if a grouting of 20 per cent. is uniformly employed, as appears to be the general tendency, one apparently obtains a rapid and efficacious result.

Unfortunately, however, this cement does not penetrate into the small fissures, with the result that, during deep sinking, fissures which have not been closed are likely to be found.

In order to convey a light cement into restricted fissures and a dense cement into open ones, it becomes necessary to conduct a preliminary examination. That is to say, to predetermine the pressure necessary to introduce a certain volume of water per minute into any particular crevice.

Such a measurement involves merely a determination of the constant of the sinking apparatus, taking account of the diameter of the rod and the depth of boring, these measurements, of course, possess only a relative value and indicate with certainty only that in any particular borehole the fissure which has to be cemented is more or less open than those previously treated. From this, however, one can get some kind of idea as to the capacity of the opening.

French engineers, who have given thought to operations of this description, have shown clearly that the dirt produced by the work of boring has a tendency to enter the fissures and prevent the cement from taking due effect. The various methods which have been adopted to execute boring with a current of water or by washing the fissures by pumping are convenient for small depths, but these palliatives unfortunately cannot be applied to depths of over, say 330 ft., since they then become slow, costly and not altogether efficacious.

Reduce the Amount of Dirt

In case of greater depth it becomes necessary to apply other principles. The borings should be made of small diameter in order to obtain as little dirt as possible. They should be made, if practicable, with the crown bit, which gives heavier pieces of material than does either the saw or trepan. The work should be done in a reverse current of water, and the cement injected methodically to each fissure as soon as encountered by the boring tool.

The favorable influence of the reverse current of water is clearly illustrated in Figs. 3, 4 and 5. It will be seen that the current exercises at the bottom of the cutting a suction action, relative of course, while it has a tendency to throw the dirt about. The facility of ascension in the rod is easily observable by the spectator who notices the cuttings coming out of the discharge during the course of work like small projectiles.

Boring contractors know well that a reverse current is dangerous because it produces in the boring falls of material with consequent jamming of the rod. Methodical cementation of fissures or frequently introducing into the borehole, cement under a pressure of 15 to 20 atmosphere, converts a hole which would otherwise have many loose particles along its side ready to fall to the bottom into a veritable tube of compressed concrete, effectually preventing any dislodgment of material.

The Three Essential Features

The three special features of this method of cementation are, therefore, boreholes of small diameters, the use of a reverse current and methodical cementation. These operated together form the characteristics of the method employed by the Société Anonyme de Forges et Enterprises Minières Trefor of Brussels.

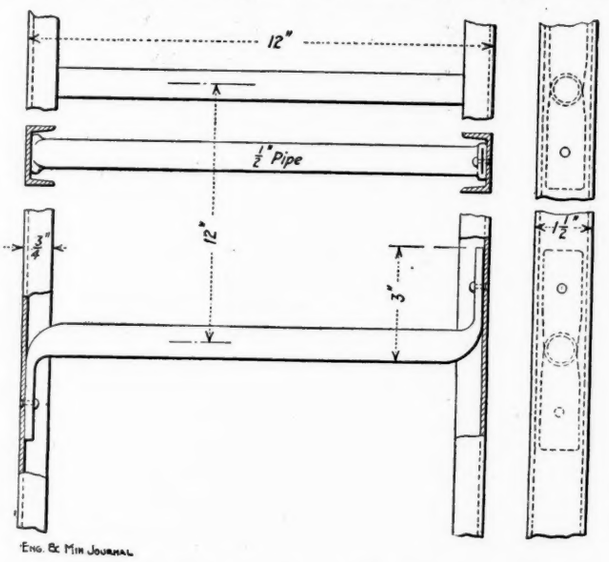
Mining organizations which are forced to sink deep shafts have, of course, as a particular object the saving of time. From this point of view, methods which consist of boring a ring of holes and injecting cement through them before beginning to sink a shaft require long periods for great depths.

With methodical cementation on the lines described above, effected by light and transportable apparatus, it is possible, however, to keep the section of the shaft free from boring apparatus, and to actively carry on shaft sinking at the same time. By this means the work of cementation progresses simultaneously at from 45 to 60 ft. in advance of the shaft sinking. The work of the sinkers is, therefore, executed in ground which is practically a monolith.

Fig. 6 shows the arrangement of apparatus for such shaft-sinking methods carried on under the Trefor patent, and needs no explanation. This system is being adopted with considerable success, not only in France and Belgium, but also in Great Britain and other countries.

Portable Steel Ladder

The Penn Iron Mining Co., on the Menominee range, is adopting an all-steel ladder underground and its introduction into coal mines having steep pitches is well worthy of consideration. The following note is taken from the columns of the *Engineering and Mining Journal*. The illustration shows the type used in stopes and manways where the installation is more or less temporary. The ladder is 12 ft. long, 1 ft. wide and weighs a little under 50 lb. The sides are 1¼x¾-in. channels with the flanges inside; the rungs are of ½-in. pipe. The



Light All-Steel Ladder of Pipe and Channel

ends of the pipes are bent at right angles in opposite directions, flattened and riveted to the channels, the rivets being countersunk on the outside. The ladders are of unusually light construction, but are found to stand up well in service and are extremely convenient to carry about and place as needed. They are found preferable to the type first tried, built of heavier channels and ¾-in. pipe and weighing nearly twice as much. For permanent installations, as in the shaft, a much heavier ladder is used, built also entirely of steel.

Notes on the Prevention of Explosions in Coal Mines

By George S. Rice*

SYNOPSIS—The paper gathers together a number of the most important facts relating to explosions, most of which have appeared but may have been overlooked by readers. Noteworthy remarks are that rock dust is proved to be of value and should be used, and that an explosion can as readily originate in stagnant as in moving air except, perhaps, where several shots are fired following each other. In that case the speed of the current may keep the dust in suspension and so in such a condition that it is readily susceptible to inflammation.

Although the explosibility of coal dust without the presence of gas (methane) has been universally conceded by mining men in this country, so that a mining man considers the statement trite that coal dust in the form of a cloud will explode, yet, nevertheless, the development of means of preventing explosions has not made as rapid advance during the past year or two as it did during a few previous years. In certain mines in which disasters have occurred, investigations made by the engineers of the bureau have shown that there have been extensive stretches along the roadway and the sides of passageways in which there was much dry coal dust.

The Moisture Must Be Everywhere

Here and there on such roads there have been wet patches, some of considerable length, and these the mine officials have thought gave sufficient protection against a widespread explosion. Also during warm weather dust precautions have been neglected in many mines, possibly because the emphasis laid on the greater danger from dust in winter has caused relaxation of effort in warm weather.

Further, many mine officials have thought that there is no danger if the entering air has a high relative humidity, although this condition is not in itself an assurance against an explosion. It is only as the current deposits moisture that protection is given. In mines where only scattered places have been wet, an explosion well started has been known to jump the wet places, carrying its own ammunition of coal dust in the advance air wave, and gaining fresh energy on reaching dry places beyond.

Several great disasters during the past few years have occurred in mines rated as "nongaseous." A miner has gone to the face of a working place with an open light, unaware that there had been an accumulation of gas since the last inspection, or since he had fired a shot; the gas has been ignited and the flaming has been sufficient to stir up coal dust and start a great coal-dust explosion that has swept the mine. Some of the mines so swept by explosions were well ventilated and their return air currents carried merely a trace of gas, but methane had suddenly escaped at certain faces where faults or clay slips had been encountered.

One conspicuous result of the investigations of the mining engineers of the bureau is that in not one of the many extensive explosions since the mine-accident investigations began in 1908, has there been anything perplexing or mysterious as to the agent that propagated an explosion through a bituminous-coal mine, although the origin of a few explosions may have been in doubt. Wherever an explosion has passed there has been ample evidence that there was sufficient or more than sufficient coal dust to feed it, if not at every point, then in accumulations at places along the passageways.

Shotfiring in Still Air or in a Current

In the western interior region a theory prevails that explosions are less likely to occur if there is little or no ventilation at the time of shotfiring. Tests at the bureau's experimental mine at Bruceton, Penn., have indicated that an explosion may start from a single shot as readily in a quiet atmosphere as in a strong current.

However, if there has been preliminary raising of coal dust in the air by rapid shotfiring, undoubtedly the dust is more likely to remain suspended in the air when there is a strong current than when the air is quiet, so that possibly the danger of a dust explosion being propagated is slightly increased by the current.

On the other hand, if a mine makes any gas, it is probable that any lessening of the danger of propagation by stopping the fan is offset by the accumulation of gas (methane) at the face. Moreover, it must be remembered that explosions have been propagated by coal dust alone through the experimental mine where before the explosion there was a perfectly quiet atmosphere.

What We Know about Dust Explosions

Tests have demonstrated (*a*) that an explosion of coal dust may become rather violent after it has traveled three or four hundred feet along a passageway; (*b*) that it may reach a violent stage in 500 to 800 ft. from the origin, depending on conditions; (*c*) that an explosion may be made at will in an entry or passageway in which the roof, sides and floor are wet to the touch, if sufficient dry coal dust is present; (*d*) that a high relative humidity of air, which may even be nearly 100 per cent., has in itself no appreciable effect in preventing a coal-dust explosion originated by a blown-out shot, a result that may appear to nullify the recommendation to humidify the ventilating current, as advocated by the Bureau of Mines and by various persons, but does not, since, as repeatedly emphasized, the purpose of humidifying is both to prevent an unsaturated air current from absorbing moisture from the coal dust and to cause moisture to be deposited along the roadways; (*e*) that a single shot improperly placed and loaded with long-flame explosive may cause the ignition of coal dust; (*f*) that it makes no perceptible difference, so far as the origination of an explosion is concerned, whether the air is moving* one way or the other

*Chief mining engineer, Bureau of Mines, 40th and Butler Sts., Pittsburgh, Penn.

Note—Abstract from technical paper 56 of the Bureau of Mines, entitled "Notes on the Prevention of Dust and Gas Explosions in Coal Mines."

*Experiments have not been made to ascertain the effect produced when the air is moving at very high velocities.

at the point of origin or is quiet, but that the important factor is the presence of sufficient dry coal dust; (*g*) that pressures as high as 120 lb. per sq.in. have been measured at right angles to the movement of the explosion, the pressure in the line of advance of the explosion being no doubt much greater; (*h*) that comparatively small quantities of coal dust, 1 lb. per linear foot of entry, equal to about one-fifth ounce per cubic foot of space, will propagate an explosion; a smaller quantity has not yet been tried in the mine†. This small quantity scattered on roof, side projections and floor is barely noticeable.

Are You Sure the Dust Is Wet?

The bureau's experiments have indicated that an explosion cannot originate in thoroughly wet coal dust, because the dust will not be thrown into the air as a cloud by the shock from a shot or by other means, but that it is not easy to wet piles of coal dust even with well humidified air currents. This is an important feature not fully understood hitherto. When a saturated air current passes through a mine it dampens the roof, floor and sides, but the coal dust itself when in accumulations appears to repel drops of moisture; even with long exposure dust like that from the Pittsburgh seam takes up only 1 or 2 per cent. of moisture, though the walls and floor may become damp.

The surprising result of this series of experiments makes it evident that it is necessary to remove coal-dust accumulations, so that, after a passageway has been well dampened, any particles of dust falling on wet surfaces will themselves become wet. It has been observed after some dust-explosion disasters that the explosion has traversed entries in which there was standing water along the bottom, but on the other hand, examination of the benches and projections along the sides of such entries has disclosed quantities of dry dust. Also it has been observed that timbers frequently carry on their upper surfaces quantities of dust sufficient to propagate an explosion. Consequently, the bureau is led to emphasize two precautions, namely, *first remove all accumulations of dry dust and then keep the entries wet or use a coating of rock dust. There will then be little danger of explosion.*

Bureau Commends Rock Dust

At the bureau's experimental mine, experiments have been made with rock or shale dust as an alternative to watering. The dust has been made from the draw slate over the Pittsburgh bed with a hammer crusher having a fine screen, 95 per cent. of the dust passing through a 20-mesh sieve. Tests have been started only recently, but the results obtained supplement and corroborate those obtained at the experimental galleries in France and England, showing that when inert dust or rock dust is placed on all projections and on the floor (even if some coal dust be present it will be buried) the mine will be free from the possibility of an explosion of coal dust.

The bureau's work has not gone far enough to permit the determination of the precise amounts of rock dust necessary, but it is believed that there should be at least twice as much rock dust as coal dust. If the amount of rock dust even equals that of coal dust the chance of an explosion starting is very much lessened; but as more coal dust is apt to be present than is supposed, the only safe plan is to put on the rock dust abundantly.

Taffanel Barriers Are Good But Don't Rely on Them

The bureau has made numerous experiments with the so called "Taffanel barriers," consisting of 10 shelves one-half yard wide and 2 yd. apart, placed over the roadway and piled with rock dust as high as possible, thus forming an obstruction of about 15 per cent. of the cross-section of an ordinary passageway, if this roadway is less than 7 ft. high. More shelves can be employed if the conditions seem to require it. In tests with such barriers explosions have been checked within a few hundred feet after the explosive wave has encountered them. In one test the pressure recorded was 120 lb. immediately before the barrier and only 12 lb. 300 ft. farther out.

In the French gallery the experiments were equally successful; but in the Clarence mine disaster in France, in 1912, in certain places where there was a light explosion and consequently little pressure, the explosion passed the barriers without displacing the shale dust. The failure of the explosion to displace the shale dust was somewhat exceptional and should not lead to condemnation of the barriers as a secondary defense.

Therefore the use of barriers is suggested by the engineers of the bureau as suitable, for example, at the entrance of the ventilating splits, particularly in haulage ways, where there is nearly always an accumulation of dust, and at intervals along the main entries, but they should be considered only as supplementing the other means.

Watch Dust in Gobs and Don't Use It for Ballast

As regards means to lessen the danger of explosions, the prime essential is to reduce the production of dust. The excessive use of explosives, particularly in shooting off the solid, causes large quantities of dust to be blown into the gobs and other inaccessible places.

It is unwise to use broken coal or machine or hand cuttings as ballast for haulage. Even if the coal is in lumps, sooner or later it will be crushed to dust. If an incipient explosion starts, this inflammable material will be thrown into the air and be a source of danger. Use either rock, clay or cinders for ballast.

Shooting "Cracking" Shots Condemned

The use of permissible explosives would prevent many disasters that occur in parts of the Southwest, where so called "cracking" shots are employed. Such shots made by drilling holes 12 to 14 ft. straight into the solid and using five or six sticks of dynamite are a menace both to shotfirers and to the mine and cannot be too strongly condemned.

Permissible explosives of the stronger kinds should also be used in lifting bottom, breaking rock bands or brushing top. There is often as much danger in using dynamite for this purpose as for shooting coal, as coal dust is liable to be present in dangerous quantities. A number of explosions have been caused during the past few years by this use of dynamite.

Mine Car Which Leaks Dust May Later Serve as a Hearse

The second greatest agency in dust making is the mine car. It is often loaded with coal 9 to 18 in. above the

†The theoretical amount of Pittsburgh coal dust, if complete combustion takes place and all the oxygen is consumed, is 0.12 oz. per cubic foot of space.

sides. The coal on a car so loaded may strike the timbers or roof, or be so jarred that it is dislodged and thrown into the roadway, where it is ground to dust by the car wheels or by men and mules or horses. Again, cars with gates or open joints leak dust.

The remedy is drastic, but should be followed. Tight cars and, wherever possible, cars without gates should be used. Wagons of the latter type can only be dumped with a revolving tipple. In Europe, except in Wales and Scotland, tight cars without gates are universally used in coal mines. Side-revolving tipples are employed for dumping the cars, and by proper arrangement the coal is dumped with little breakage. In building or buying mine cars the endeavor should be to get a car as tight as possible, and enough cars should be supplied so that the miners will not be compelled to pile the coal up above the sides.

In addition to tight cars, automatic sprinklers adjacent to the gathering places and sidings should be used so that the cars may be drenched as they pass under a spray. The automatic spray system, operated by a lever depressed or moved by the passing car, is effectively used in a few mines in this country and in many abroad. If well arranged it washes the dust from the top of the car and prevents it from being dropped or blown off by the air currents along the roadway.

Rock Castle Mine Explosion

SPECIAL CORRESPONDENCE

SYNOPSIS—An explosion of gas at the Rock Castle mine located at a town of the same name near Abernant, Ala., killed 12 men out of 90 in the mine. The explosion was quite local. Four men may have been overcome by afterdamp.

Twelve men, five white and seven colored, were killed in a gas explosion which occurred at 8:45 a.m., in the Rock Castle mines of the Davis Creek Coal & Coke Co., at Rockcastle, Ala., on Saturday, Jan. 10, 1914. The mine is located in Tuscaloosa County, about 35 miles south of Birmingham, on a branch of the Louisville & Nashville R.R.

TIPPLE AT THE ROCK CASTLE MINE, WHERE A RECENT EXPLOSION KILLED 12 MEN

FOREMAN OR HELPER IGNITES GAS

The gas was probably ignited in the 21st room on the 17th right entry, by Mine Foreman Wood W. Quarles and a brattice man, Frank Tillery. All the men killed by the explosion worked on the 17th right entry. Most of those who met death were terribly burned and apparently all but four were killed instantly. Four bodies were found along the heading and it is possible they were those of men who were overcome by afterdamp.

On the morning of the explosion, the fireboss, W. Lawrence, discovered some gas in the 21st, 22nd and 23rd rooms of the 17th right, all of which rooms were idle, and, as usual, he reported them to the mine foreman before the miners entered. Shortly after the miners had gone to their places, Quarles and Tillery, carrying safety lamps, went down to investigate the rooms reported by the fireboss. Just what they did can never be known, as they and all the other men on this heading were killed by the explosion. Mr. Tillery's body was found in the 21st room, about 50 ft. from the mouth and Mr. Quarle's body was on the heading. The 17th right contains 29 rooms, but only those inside of the 24th were being worked.

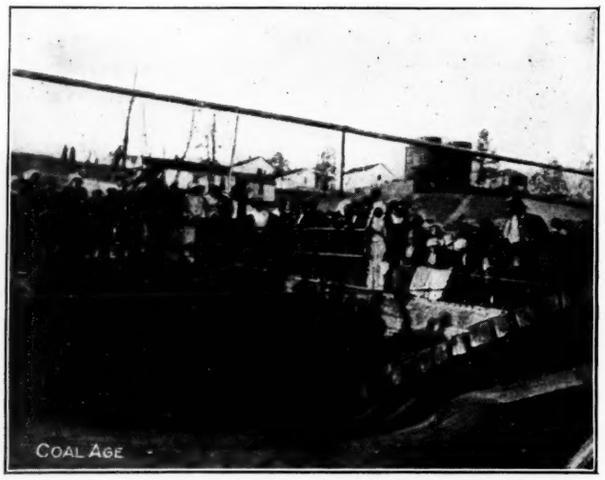
The mine has generated some gas, during the past year, but has never been considered dangerous and all the men worked with open lights. The mine has been working for a number of years and no fatalities from gas explosions have ever been reported. Some afterdamp was created by the explosion, but most of the recovery work was done without the aid of helmets. All the bodies were recovered by 7 p.m. Some 5 or 6 brattices on the 17th right were destroyed by the explosion, but no other damage was done to the mine and work will be resumed in a few days. No evidence of the explosion was visible on the 17th heading outside of No. 20 room. About 90 men were at work inside the mine when the explosion occurred.

RESCUE WORK

News of the explosion reached the Birmingham office of the company about noon and almost immediately offers of assistance were received from the Tennessee Coal,

Iron & R.R. Co., which volunteered to send down its car. J. C. Maben, Jr., vice-president of the Davis Creek Coal & Coke Co., decided that the "Tennessee" car could not reach the scene of the accident in time to render service, but requested that the Government auto truck be started immediately. It was found that G. B. Sutton in charge of the Government rescue station was out of the city, delivering a lecture at one of the mines of the Alabama Fuel & Iron Co.

Mr. Hamilton, of the DuPont Powder Co., and Mr. Newby, of the Jefferson Powder Co., were then communicated with, as they had made several runs with the automobile rescue car and they consented to take the truck to Rockcastle at once. They arrived there about 3 o'clock. Chief State Mine Inspector, C. H. Nesbitt and assistants, F. Hillman and D. Kelso, left at once in an automobile, as did also J. C. Maben, Jr., vice-president of the company. Assistant Inspector Smith, who happened to be in Tuscaloosa County, was notified by wire, and joined the others at Rockcastle.



SCENE AT THE MOUTH OF THE SLOPE AFTER THE EXPLOSION

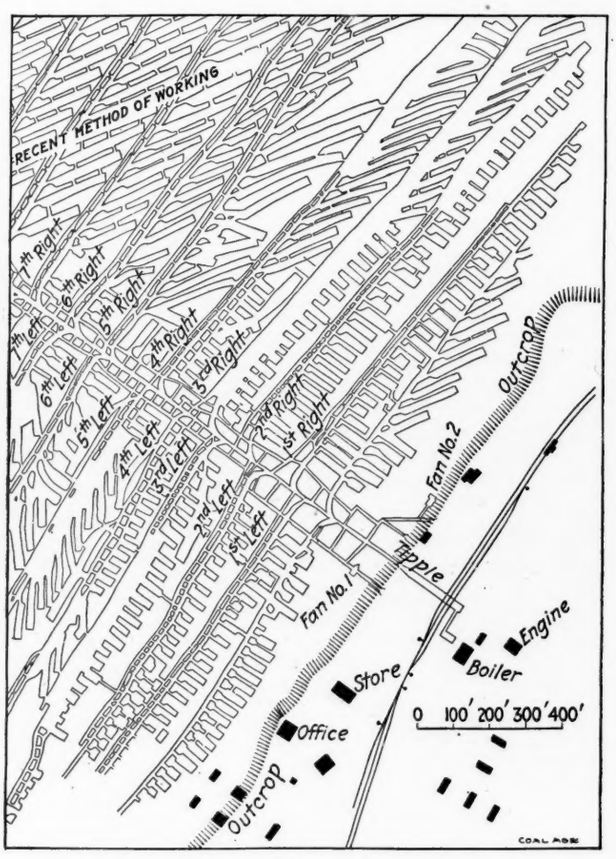
Those who lost their lives are: Wood W. Quarles, mine foreman, Frank Tillery, brattice man, 3 Austrians, Phil Malner Joe Bosneck, John Hondlin, and 7 colored men, John Brown, Elmore Lyons, Nathan Blakely, Sam Brown, Harry Tinker, Charles Fancher and Dennis Thomas; Nathan Blakely and Sam Brown being drivers.

Only the men in the headings above and below the 17th right knew that anything unusual had happened and some of them immediately rushed outside and notified George Kuffner, the superintendent. Word was then sent to all the men in the mine to come out immediately. As soon as Mr. Kuffner was sure that all the men were out, with the exception of those working in the 17th right, he had a brattice put across the slope at that heading and reversed the air current, making the heading the intake so that all the incoming air was forced up into that entry. When this was done, the rescuers were able to penetrate to the face of the 17th right without helmets, but they did not attempt to go into the rooms, until the helmets arrived. Eight bodies were located before that time. A. H. Witt, the mining engineer of the company, accompanied the rescue crews, as, next to the mine foreman who had been killed, he was most familiar with the mine workings.

MINING CONDITIONS

The mine is opened on the Jagger seam which pitches at about 18 deg. at this point and consists of a single slope, with an airway on either side. Right- and left-hand entries are driven off this main slope. Roof and top are excellent and taking into consideration the thickness of the seam, which is 6 ft., mining conditions are good. The coal is mined with picks and shot down with the permissible explosive "Monobel." Ventilation is induced by two blowing fans, one on either side of the main slope, and has always been considered ample.

The mine was opened eleven years ago by J. C. Maben, Jr., who was then a young mining engineer, almost fresh from college. The venture was so successful and reflected so much credit on the young man's management, that two years ago he was elected vice-president of the Sloss-Sheffield Steel & Iron Co., one of the largest iron and coal corporations in the South. He still retains his holdings and office in the Davis Creek Coal & Coke Co. Geo. Kuffner, superintendent of the mine, is a brother of a former assistant state mine inspector.



THE ROCK CASTLE MINE, ROCKCASTLE, ALA.

The workings in the 17th right where the explosion took place are like those in the 7th, 8th and 9th right.

As in all mine accidents, the scenes at the pit mouth, following the explosion, were pathetic in the extreme. There, huddled together, anxiously waiting, were the sorrowful wives and mothers of some whose fate was all but guessed, and watching with them, stood the young man whose enthusiasm, but a few short years before, had brought them there.

An Analysis of the Ohio Mining Commission's Report

By A. T. Shurick

SYNOPSIS—The gradual leaning toward paternalism, on the part of both state and federal governments, is becoming more and more marked. The investigation of the Ohio legislature is the most important step that has been made in this direction, so far as concerns the coal industry. The changes proposed are of such a radical nature and will indubitably be so far reaching in their effect on legislation in other states, that coal engineers in all parts of the country are closely following the progress of the movement. The issue is of such importance that the recent report of the commission appointed to investigate the situation justifies more than the ordinary review. The present installment of the review takes up the preliminary considerations.

In the face of severe criticism on the part of the coal press generally throughout the country, Ohio has quietly persevered in its determination to solve the problem of providing an equitable basis of payment for her miners. In pursuance of this plan, a report has been compiled dealing with this question in all its ramifications. The report, as a whole, reflects creditably upon the commonwealth and, incidentally, forms one of the most valuable treatises on certain branches of technical coal literature that has ever yet been published. It is such a report as could only be compiled by months of careful and painstaking research work.

It is obvious to the most casual readers that the authors have approached their task with minds open to conviction. They have consulted and examined reputable authorities recommended by both sides of the question and have shown a keen insight where any attempts at misconstruing the actual conditions were made. They visited most of the mines in their own state, and some in others, as well as a number of the large consuming plants and distributing centers. Their conclusions are honest, accurate, and, in the main, founded on the soundest practice in coal mining.

While the subject has been handled in a masterful manner, it is none the less true that the commission has placed itself on record as favoring concededly radical innovations—changes which are regarded by some as the visionary effervescence of the impractical altruist. But it is equally true that our best students of mining economics are agreed that it is only a question of time until some of these proposed changes become accepted practice.

The pioneer in new thought lays himself open to much criticism from the more conservative element, and since the province of the reviewer is destructive rather than constructive, impartial and unbiased issue is freely taken throughout this paper with many of the findings of the commission.

Geology and the Coal Reserves

As becomes a monograph of this character, designed as it is rather for the *dilettante* than the professional, a labored effort is made throughout to maintain as non-technical phraseology as possible. The report opens with a brief and clearly expressed synopsis on the modern theories of coal formation. It is regrettable in this connection that local authorities are quoted to the exclusion of all others; surely, Dana, Le Conte, or the more modern Salisbury and Chamberlain would have carried greater weight with the well informed reader. This almost provincial disregard for the world's accepted authorities naturally affects the prestige of the report in the minds of the professional.

In addition to this, the paper is rather overburdened with considerable speculation regarding the actual coal resources and what these might have been under other conditions. "Something like 10,000 square miles" is given as the estimate of the coal-bearing area in Ohio. It is rather strange here that the United States Geological Survey reports should have been so completely ignored, particularly since these give actual tonnage figures and not the rather meaningless square miles.

Thus we find the geological survey estimates the area "known to contain workable coal" at 12,660 square miles, containing originally 86 billion short tons of coal. From the earliest time for which records are available, in 1838, to Jan. 1, 1913, the total extraction has been only 646 million tons, or 0.0075 of the total original supply, less than 1 per cent. In view of the fact that the commission lays considerable emphasis on the importance of conserving the coal resources, it seems only fair that the best information available on this subject should be included.

It also appears that the commission might advantageously have quoted like figures for other coal districts, in order to give the reader a basis for determining the relative status of Ohio as compared with other fields. For instance, the situation might aptly be compared with conditions in England where the coal reserves are estimated at 147 billion tons. The *annual* production there is at the rate of 270 million tons, or about 0.002 of the total supplies, while Ohio's *gross production* during the three-quarters of a century since the inception of mining is only 0.0075 of the reserves, as already pointed out.

Conservation and Competition

Mining and conservation of the coal is the next topic taken up. The commission reiterates the already generally accepted conclusion that more effective systems of mining must be employed in order to obtain a higher recovery. As compared with other states, a rather broad hint is given at the backwardness among Ohio operators in adopting modern methods of mining.

After justifying its position in taking up the conservation phase, the commission goes into a detailed discussion of this question, particularly from the point of view of the mining man. A regrettable feature of the investigations along these lines is the persistent policy of giving preference to the testimony of geologists. The problems arising in this connection are those of the engineer entirely. It is essentially a question as to whether the coal can be economically mined in such a manner as to

effect the maximum recovery, and this is clearly one for the engineer and not the geologist. It is not within the province of the geologist to determine issues in practical mining, and it is a disappointing feature of the report that utterances based upon the impractical altruistics of men entirely uncontrolled by the economics of competition should be given such weighty consideration.

It is here noted with much interest that the commission takes a sharp rap at "our drastic anti-trust laws, both National and State." It has been pointed out repeatedly that conservation and competition in the coal industry are *concordia discors*. On the one hand the operator is accused of despoiling the Nation's coal reserves and urged to adopt systems and methods for eliminating this waste. On the other hand, he is being forced to market his product under the most adverse conditions conceivable, and often at a figure that scarcely covers the cost of production. Where, then, are the additional funds necessary to the adoption of more efficient methods of working to come from?

Thorough Preparation Must Be Assured

Passing over half a dozen pages on the nomenclature of the Ohio coal horizon with comments upon the economic possibilities of the different seams, we arrive with interest at the opening gun on the mine-run discussion. In a general prologue the commission emphatically states that: "Unless the Ohio coals are carefully mined and are reasonably free from impurities, they will reach the Northwest in a less satisfactory condition than the coal of other fields, and in such keenly competitive fields, the margin of profit is very low." The commission further states that "the Ohio operators would soon be driven out of their most valuable markets" unless they can "guarantee clean coal, mined in such a way as to bear transportation in large lumps."

Much testimony was taken by the commission to bring out the proportion of coal lost by the present systems of mining in Ohio. The different authorities examined placed this, under normal conditions, at a minimum of 25 per cent. to 35 per cent., the commission itself, from the results of its examinations, being of the opinion that from 35 per cent. to 40 per cent. was left in as pillars, while it often ran as high as 40, 45 and even 50 per cent.

Systems of Mining

Following this the commission naturally turns to the various systems of mining used in the state, in order to demonstrate how these losses occur and prescribe remedies for same. The report segregates the systems in this country, under four general headings as follows: Wide room and narrow pillar system; narrow room and thick pillar system; the panel system, and the longwall system.

Wide Room and Narrow Pillar System—It would be surmised from the report, that this system is used mostly in small operations, where little consideration is given toward effecting a large recovery. One of the principal objections which the commission takes to this method, as regards the present controversy, is the difficulty in getting miners to work pillars which have been badly crushed by the abnormal load thrown upon them. Naturally such coal would yield a maximum proportion of slack, which the miner is not paid for, and the objection is well founded.

..Narrow Room and Thick Pillar System—This method differs from the one just described in that larger pillars are left with a view to ultimately recovering these when the mine is abandoned. It is estimated that as high as 90 per cent. of the entire seam may be worked out by this system, although probably on an average of from 75 to 80 per cent. is about all that is generally mined.

The Panel System

Panel System—After a brief description of this method the commission goes into a detailed discussion of it. Obviously it meets with great favor. As pointed out in the report the method is not adaptable to districts where land values are high, because of surface subsidence, but inasmuch as the mining regions of Ohio are generally hilly and of little value for farming purposes, this objection loses in importance.

It is noted here that the commission shows a commendable leaning toward the more advanced methods of mining, particularly those now practiced in West Virginia. Thus the Gary, W. Va., mines of the United States Steel Corporation, operated under leases granted by the Pocahontas Coal & Coke Co.,* are heartily commended by the commission.

Taking up the question as to why Ohio operators have not voluntarily adopted the panel system of working, the report ascribes this partially to a general belief that this method involves a much greater initial expenditure. This, the commission thinks, is due to the erroneous belief that all narrow work must be driven out to the boundaries before the work of extraction on a large scale can be undertaken. The report correctly disabuses this theory by stating that active mining may be prosecuted as soon as sufficient development work has been done to open up a single panel. While this, of course, is true, it none the less conveys a wrong impression, since the expenditure necessary to accomplish this is ignored; it is difficult to conceive a system of panel working that would not require at least half a mile of development work, consisting of from two to four entries. Driving such an amount of narrow work obviously involves not only a large expenditure but an important interval of time.

As the main reason for the objection of the operators to the adoption of the panel system, the commission believes that this is due to the extra expense incident to driving entries and working narrow places. It must, of course, be conceded that this system requires a greater amount of entries, and the operators are indubitably justified in their stand in this matter, providing a proportionate increase in the market value of their product cannot be obtained.

In so far as this objection applies to driving narrow rooms the position of the companies is not so well sustained. While it is true that the use of narrow rooms is commonly applied in the panel system, this is not by any means essential. As a matter of fact, the system originated in fields where the roof could not be held except with narrow places, such as, for instance, the Connellsville district. While roof conditions in Ohio, as a rule, are not particularly favorable, there would hardly be any logical reason for adopting the narrow rooms used in the panel system in West Virginia. The miners also

*A complete detailed description of the panel system in the Pocahontas field will be found in "Coal Age" this week. Descriptions of other systems used in West Virginia will also be found in Vol. 1, pp. 278 and 305.

find objection to this method, under the present basis of payment, for the reason that it does not yield such a large proportion of lump coal.

Longwall System—Although the commission says: "This is undoubtedly the best system of mining wherever it is practicable," the report disposes of it in a single brief paragraph. This it does on the grounds that "it is generally admitted by practical miners and mine operators that this system could not be employed to any considerable extent in Ohio." In a report so replete with innovations of every character, it is rather disappointing to see this system passed over in such a casual manner. To the true conservationist the longwall system is looked upon as the millennium.*

Regulating the System of Mining

As to a general corrective, the commission rightly points out that no one system of mining could be specified for the reason that many mines now operating could not conform to such a system or could do so only at a prohibitive expenditure. But the commission does boldly advocate a departure from accepted practice by recommending state supervision of the systems of mining employed. It is worthy of note in this connection that many conspicuous figures in the coal industry today, as for instance Francis S. Peabody[1] and other of our ablest thinkers, look with favor upon some such regulation.

The first question that naturally arises is how such a plan will work out where the Ohio coals come into competition with those from adjoining states not so handicapped. While the plan certainly has much to recommend it and indications are that the no far distant future will see it in general practice, it is none the less inevitable that the pioneers will suffer a certain economic disadvantage. The measure is similar in many respects to the building laws in effect in all cities, and aside from the economic aspects there are no reasonable grounds why it should not be a success, providing it is not made the toy of unscrupulous politicians.

In justification of legislation along this line, the commission points out the fact that there is similar supervision exercised by the Pocahontas Coal & Coke Co. in connection with the leases of that concern. This is rather an unfortunate comparison. As is well known, the Pocahontas Coal & Coke Co. is essentially a holding concern, controlling practically the whole, or at least the best part of the original Pocahontas coal. Since this is one of the highest-grade fuels, if not the highest, in the country, it commands a ready market at any time. The marketing of coal at a profit is the most vital problem in the fuel industry today, and it is obviously unfair to compare Ohio, with her relatively lean coals with a district so advantageously provided for in this respect.

The commission concludes Part I of its report with flattering comments on the safety precautions at Gary, W. Va.[2] The report says: "Nowhere has this commission seen such elaborate and complete precautions taken to prevent accidents as are to be found in the mines operated under these leases by the U. S. Steel Corporation."

The Fatality Problem

Part II of the commissioner's report deals with "Prevention of Accidents." After justifying itself for taking up this phase of the question, the commission states in a general prologue that the adoption of the panel system of working would not only be an important conservation measure, but would also tend to lessen the number of accidents due to falls of roof and coal.

Attention is called to the well known fact that most of the fatal accidents are due to this cause, and the commission is of the opinion that most of these could be prevented by the adoption of similar strict rules as those already mentioned at Gary, W. Va. Comments are also made on the fact that one-half the fatal accidents in the Ohio mines are sustained by men of foreign birth, and some well defined conclusions are drawn on the lack of experienced miners in the Ohio field. It is generally conceded by all coal engineers that this is a prolific cause of fatal accidents.

Having thus prepared the way for further departures from accepted practice, the commission promulgates its recommendation: "Need of Safety Foremen." Casting about for a means for justifying its position in this matter, the commission lights upon its illuminative, if not convincing, analogy between coal mining and railroad-maintenance work. Thus it is pointed out that every few miles of railroad has a section gang of six or eight men under the direction of a section boss, while "there are often times found many miles underground workings in which are employed one or two hundred men with only the supervision of a boss and one or two assistants."

Considering the personnel of the commission, it is indeed surprising that such an obviously unfair comparison should be allowed to creep into their records. As everyone knows, railroad work of this character requires continuous and experienced supervision to insure sustained effort on the part of the workmen, and that the work be properly executed. On the other hand, the miner, once started, works in a purely mechanical manner and is remunerated in direct proportion to the amount of labor performed.

As is pointed out in succeeding paragraphs, however, a closer supervision of mining work will no doubt do much toward reducing the fatality rate. Coal mining naturally does not attract a high class of labor which accentuates the dangers and makes essential that the work be carefully watched.

A Study of the "Safety Foremen" Proposal

The commission places itself on record emphatically and positively, as recommending the enactment of a law requiring the employment of a safety foreman for each 25 miners. In addition, it is of the opinion that these safety foremen might well be given police powers for the purpose of arresting miners violating the rules. It is proposed that these foremen be required to fire all shots, which is undoubtedly a commendable provision, since it places this dangerous work in the hands of what should be, at any rate, experienced and competent men. This proposition to inject a tone of militarism into mine operations, although a new departure in this country, still has much to commend it. This has been developed, to a large extent, in European mines, particularly in Germany, and with gratifying results.

In this proposal to engage safety foremen we again encounter the question of economics, but it is noted with satisfaction that the commission faces the question square-

*An interesting paper on longwall and conservation appeared in "Coal Age," Vol. 1, p. 475.

[1]See "Coal Age," Vol. 3, p. 691.

[2]See "Coal Age," Vol. 3, p. 347 for a detail description of these safety precautions.

ly. The report agrees that the operators would naturally take issue with this condition on the ground of the additional expense, but it is rather surprising to find that it says further: "The expense of operation would not be increased by the full amount of these wages and probably not at all." Presumably, this is to be accomplished by having the safety foremen devote a portion of their time to other duties. Such a scheme is hardly to be recommended for the reason that the distinguishing line between the ostensible occupation of these men and the other duties they were called upon to perform would gradually disappear with the result that their usefulness in this connection would ultimately be destroyed. Such has been the experience in most instances where a firm stand has not been taken in the matter, and the men held closely to a single duty.

Cost of the Safety Foremen

In order to arrive at an approximation of what expenditure would be involved in the employment of these safety foremen, let us assume there are 35,000 men* in Ohio engaged in mining coal at the working face. If one safety foreman be employed for each 25 of these men, this would necessitate 1400 additional men, which, at $3.50 per day, would mean $4900 per day. Assuming the mines to work 200 days[1] this would mean an annual expenditure of $980,000. Computed on the basis of a production of 34 million tons, this amounts to 3c. per ton. Whether the Ohio coal industry is prepared to carry this additional burden is a grave question and one that must be given serious consideration.

The commission further points out that, under the new workman's compensation act, the 100 deaths occurring annually in the Ohio mines, as the result of falls of all kinds, will involve an expenditure of $375,000 in indemnities, and suggests that a reduction in a considerable proportions of these would wipe out much of the cost involved in employing the additional men. Properly carried out, this system will, no doubt, effect an important reduction in the death rate, as has been proved at Gary, but even the complete elimination of all fatal accidents which, of course, is not conceivable, would only reimburse the operators for one-third of their loss.

One rather gathers a feeling at this point that a tone of partiality is creeping into the report. The commission is so obviously in favor of their recommendation that they have quoted the exponents of their theory to the exclusion of all others. It is true that the opinions of the engineers of the Pocahontas company are due every consideration. But the fact that a single large and powerful corporation, operating under abnormally favorable conditions, should see fit to apply concededly altruistic policies in the conduct of its affairs is certainly not sufficient grounds to justify the Ohio Legislature in forcing like measures upon their operators who are not so economically favored.

Efficiency tests for the miners is the next topic taken up by the commission. This was a measure advocated by the miners themselves and had for its purpose the testing of applicants for work in the state to determine their competency. It was proposed that all miners should be compelled to pass an examination and obtain a certificate before being permitted to accept employment. The ineffective results obtained by like measures in other states made the adoption of any such system impracticable in the opinion of the commission. Part II of the report closes with a few remarks on shooting coal off the solid.

"Unusual Character of the Miners' Demands"

Part III of the report, dealing with "Screened Coal vs. Mine-Run System of Payment," is turned to with much interest. The beginning of this part is taken up with the history of the controversy in which it is pointed out that the screened-coal basis of payment originated when the finer grades had no commercial value. When it was later found that this coal was of value, the miners repeatedly found fault with the system of payment. As early as 1883 a commission was appointed to report on this matter, and the present commission states that the controversy remains much the same, as regards the arguments of both the miners and the operators, as at the time of the previous report.

In this contention one immediately perceives the "leveling process of unionism" with a tendency to consider the successful accomplishment of a highly speculative business venture (as all mining investments are regarded) as an economic crime. The argument lacks nothing in persuasiveness but even sympathizers with social reformation will not concede the general assumption that all capitalistic interests are to be regarded as wealthy malefactors. Surely the men whose fortunes, brains and courage have been boldly flung in the balance are entitled to reap the reward of their efforts.

Under the subheading, "Unusual Character of the Miners' Demands," the report points out that these are unusual because of the fact that they call for "legislative interference in a matter which is usually left to contract between the parties concerned." It further states that such demands are usually made in behalf of women workers or children and others unable to protect themselves, while in this case the legislature is asked to interfere in the interests of the "strongest labor organization in the country." In fact, one is much impressed with the feeling that the demands savor somewhat of a labor official's boast, made during a conference between certain railroads and their employees, to the effect that: "You will give us the advance we ask across this table or we will go down to Washington and get it."

The commission finds the situation particularly incongruous in this instance, because of the fact that the wages paid to the members of this organization constitute a large share of the total wealth produced by their labor. But when it is noted that the report says further, "and when one considers the hazards of the occupation he cannot wish it otherwise," an obviously wrong impression is conveyed. In point of numbers the coal-mine fatalities are exceeded by such elemental risks as child birth, and burns and scalds, while railroads head the list by a large margin. In 1906, the fatality rate per thousand in the bituminous-coal mines was 2.77, being exceeded by eight other vocations, that for railroad switchmen being 4.50 and the trainmen being 7.46.

It is a rather notable fact that the commission concludes its comments on this phase of the question without justifying legislative interference in any way.

(To be Continued)

*See annual report of the inspector of mines, Ohio, 1912, p. 14.

[1]See the "Production of Coal in 1912," issued by the United States Geological Survey, p. 160.

Editorials

Seismic Disturbance in Its Relation to the Flow of Gas into Mines

For a number of years past this subject has received growing attention on the part of mining men, especially those engaged in the work of investigating the causes of mine explosions.

The excellent paper presented by N. H. Darton, geologist, U. S. Geological Survey, Friday evening, Jan. 16, before the New York Section of the American Institute of Mining Engineers, on the subject, Mine Gases, gave rise to an interesting discussion of the possible effect of a more or less severe seismic disturbance at one point on the globe, to cause an increased inflow of gas into distant mine workings.

While it was freely granted by all that any simultaneous occurrence of one or more mine explosions, accompanying or shortly following an observed and recorded seismic disturbance, could not be taken as produced by one cause; yet such coincidences at least suggest a possible relation between such phenomena.

Numerous notable examples of *danger periods in coal mines* occurring simultaneously with *periods of seismic unrest,* it was generally agreed, make it a reasonable matter for careful study and investigation. As examples of such coincidences in recent years, may be cited the Mount Pelée period, 1902, marked by the loss of 550 lives in four mine explosions; the Formosa, Japan, 1906, costing several thousand lives and $45,000,000 property loss, marked by the terrible Courrières explosion in which 1200 lives were sacrificed, the Takashima explosion, 307 lives, and a number of less fatal explosions in West Virginia and Colorado; which was almost immediately followed by the San Francisco disaster that destroyed $300,000,000 worth of property and over 2000 lives, the entire period covering less than two months and followed four months later by the destructive Valparaiso earthquake with a property loss of $250,000,000 and 7000 lives, which was almost immediately followed by a remarkable series of mine explosions at Bluefield, W. Va., 30 lives; Raton, N. Mex., 15 lives; Windgate, Eng., 25 lives; Johnstown, Penn., 7 lives; Pocahontas, Va., 35 lives, etc.

This was followed, again, by the Kingston, Jamaica, disaster, January, 1907, with a $10,000,000 property loss and 1000 lives, which was coincident with the renewed activity of Mt. Ætna and earthquake in Sumatra, costing 1500 lives. Simultaneous with this outbreak was the loss, in mine explosions, of 24 lives at Primero, Colo.; 250 at Essen, Germany, 12 at Lorentz mine, 84 at Stuart and 25 at Thomas, W. Va., and numerous others in other states.

In September of the same year seismographs at Washington, D. C., and in the Isle of Wight told of a severe earthquake as having occurred in the Arctic or the South Atlantic Oceans, followed by the loss of 200 lives by mine explosions in Texas, Rock Springs, Wyo., and Wilkes-Barre, Penn.

The remarkable concomitance of these periods of seismic unrest and danger in mines due to prevalence of gas point to the consideration of the globe as a unit, sensitive in a varying degree to the physical changes in its crust.

Once More!

The reader will forgive our repeating much of what we said on Jan. 3, because G. O. Smith, director of the Geological Survey, in a letter which we publish in this issue, declares to all intents and purposes that he misapprehended our editorial.

The reader will remember that we said on Jan. 3 that not all the coal lands sold since June 30, 1907, had been classified by the Geological Survey and were sold at the price set by the Bureau. We said, therefore, that the statement of "sales at *all* prices" which was presented in a declaration to prove that coal lands were held at reasonable figures was misleading.

We also said that the sales listed as made before the date mentioned were a small fraction only of those which actually took place. That all other sales were void in law is doubtless true but it does not invalidate our statement that coal-land sales of a valid character were prevented by the notion that valid titles could be obtained at less cost. This statement also was amply proved by official testimony and other witness could be given from G. O. Smith's own bulletin published in 1913.

We further said that as prices had been changed the sales at an early date did not establish the reasonableness of present-day prices. We believe, therefore, that the comparison was misleading. How much of an inaccuracy was introduced we cannot say positively, for from what we learn no account has been kept by Land Office or Geological Survey as to the sales of unclassified land since that date nor as to the invalid land patents prior thereto. We thought we made plain what our difficulty was, but Mr. Smith does not seem to have realized it despite reading our correspondence with him and with the Land Office. We made careful inquiry as to the volume of unclassified lands sold and got no statistical answer.

We did not take an exception, as Mr. Smith appears to think, to the differences between the Land Office and the Geological Survey in estimating sales. It is true we sent the Land Office the figures of the Geological Survey, and we received a letter stating that our figures were wrong and the writer did not know where we got them. But we made no reference by word or implication to this fact.

Now we cannot condemn Mr. Smith for this inaccuracy. His explanation of it is, however, amusing. He states that he could not tell from an inspection of the books when sales were made. This frank approval of the frequent contention of the Western patentee is refreshing. He has been complaining for years that he didn't know when he had effected a purchase and loudly has he berated the Land and Attorney General's offices, mostly, however, behind closed doors. Rightly or wrongly he be-

lieved the way to secure his holdings was to refrain from adverse criticism of governmental departments and bureaus. We are glad that by Mr. Smith's letter the uncertainty of his tenure has in our columns received official recognition.

Mr. Smith regrets that we did not copy the more elaborate table in his report of 1912 showing "Sales of Coal Lands at Various Rates since July, 1907." It is an omnibus list which does not segregate classified from unclassified lands. What, therefore, does it import to this controversy?

The 1913 report which Mr. Smith quotes, in a way which might make the reader think we have seen it, has not been received by us, the New York Library or the Engineering Societies' Library. We have the honor of being on the exchange list of the Geological Survey and should be favored with all such bulletins as soon as any one.

The latter part of Mr. Smith's letter refers to the condition of the coal business in the West. The prices of coal in the public-land states, as we showed editorially Jan. 10, have been comparatively steady since 1907 and we are prepared to concede that the jump in that year was not necessarily chargeable to the action of the Interior Department. But the prices in the public-land states are and have been for many years much higher than in the United States as a whole and show a climbing tendency. The difference between the figure $1.15 for the whole United States, given by Mr. Smith as against $1.65 for the public-land states as given in our editorial of Jan. 10, is sufficiently marked and perhaps we may consent to overlook the well known statistical rule that when you want to compare the wage of Sam and John per day, do it; don't compare the wage of Sam with the average wage of both.

In other words, the price of coal in the *West* should be compared with the price in the rest of the United States. His table of prices is the second table in Mr. Smith's answer to our editorial and we would like to call it "Exhibit A" and use it in rebuttal of his charges as it shows how much higher Western coal prices are than those in the East.

The first table is also one which to our statistical friends is, by nature, anathema, though it has, at times, an appropriate purpose. If you wish to find how much the output of coal in the Appalachian regions has increased, compare it with itself and not with the whole output of the United States or any other quantity.

If John puts out 99.5 tons per month and Jack 0.5 tons, together they produce 100 tons per month. Next month John decides to raise his percentage and mines 199 tons. Jack still puts out a miserable half ton. John's percentage of the whole output is 99.75 despite the fact that his actual production has doubled. By the method of investigation pursued in the table, his increase in output is from 99.5 per cent. to 99.75 or a beggarly ¼ of one per cent., whereas, by every reasonable rule of calculation, it is 100 per cent.

Such a table is misleading, though not, of course, to the degree used in the illustration. As a matter of fact from 1906 to 1912, the bituminous output of the pushing West increased 25 per cent. and in the rest of the Union 31 per cent. We would expect the West like the United States to forge ahead and the East like England to drag behind. For the East is relatively effete, that is, the opportunities for development are more largely already effected. It is interesting to note that from 1910 to 1912 a decline in output was recorded in the public-land states.

There remains for us another statement in civics. Mr. Ashley asked us to say the Survey did not sell land, Mr. Smith desires us to admit that it doesn't make the law. Can Mr. Smith contend that Congress makes prices of coal land when the law of 1873 still holds and some land has risen in that time from $20 to $600 and the law is still the same except that the Geological Survey has been authorized to evaluate the land? The prices are made without approval of Congress, without the signature of the President, according to rules over which neither have exercised any control and Mr. Smith has been the adviser from the beginning.

Did not he and Garfield designate coal land, as land containing a 2-ft. coal bed or coal not over 1500 ft. deep? Did not he and that same conservationist make a new declaration in 1908 and less than 3 months later make another, dubbing land containing coal 3000 ft. below the surface and coal 2 ft. thick, coal land?

Did not he and Ballinger make new regulations dignifying a seam 14 in. thick as coal under the act of 1873 and then finally did he not in the year just passed make a new code with Mr. Fisher so complicated that probably none but a member of the Survey could understand it? Not only is the present scale his scale, but he has repeatedly defended it. If he did not believe in the scales and opposed them his advice was rejected by three successive secretaries and he was not "intellectually honest" in his defense of what he considered wrong. We are sure, however, he *does* believe in these scales and is "intellectually honest" in his approval of them and therefore we cannot refrain from holding him responsible for their framing. They are too complicated and reveal too well trained a mind to emanate from men like our secretaries who have never, perhaps, entered a coal mine.

When Mr. Smith says he does not make the laws, we presume he must mean that he is not chargeable with having maintained the present selling system as opposed to leasing. This we readily grant, and we give him every credit for wishing and urging a change, but we have all the time urged that present prices are altogether too high and we hold that he *is* largely responsible for that fact.

Explosibility of Coal Dust

Perhaps one of the most interesting findings of the British investigators who have been working on the problem of mine explosions, deals with the question of coal dust as a factor in such accidents. It is pointed out that the inflammability of such a dust depends more on the percentage of "paraffin-yielding" constituents than on the total content of volatile matter in the coal. However, when once inflammation has been effected, the presence of matter capable of readily yielding inflammable gases on heating is not essential for the propagation of a serious explosion. That such constituents in dust are not necessary for the propagation of a violent combustion has been proved by explosions obtained with wood-charcoal dust, which element does not contain any volatile matter. The scientific conclusion, therefore, is that the violence of a dust explosion depends, not on the volatility of the coal, but on the calorific value of the dust. If this is true, anthracite dust, though difficult to inflame, will ultimately produce an explosion as violent as those produced by high-grade bituminous coals.

George Otis Smith Replies to Editorial Criticism

SYNOPSIS—The Geological Survey reports on coal sales, while probably not absolutely in agreement with those of the Land Office, were compiled with full intent to obtain correct results. The statements that the increase in the price of public coal land has reduced production and raised the price of coal in the West is disproved by statistics.

In your editorial in COAL AGE for Jan. 3, you say: "All in all, the report made year after year to the President is misleading in the extreme. The public have been deluded. The high cost of living is being raised in the West by the restriction of competition in that section."

In replying to your editorial, I do not care to match skill in invective but merely to answer two charges; the one concerning my intellectual integrity and the other relating to the adverse effect of the present policy upon the ultimate consumer in the public-land states.

THE GEOLOGICAL SURVEY ENDEAVORS TO PRESENT THE WHOLE TRUTH

"Misleading" and "deluded" charge intent to deceive. Apparently, you expect to find the administrative report of even a scientific bureau taking the same liberties with facts as a paid advocate. My associates, I am glad to state, condemn special pleading wherever found and we consider that any member of a Government scientific bureau who might withhold a single pertinent fact or "cunningly arrange" facts so as to support an opinion or theory is unfaithful, both to the people he serves and the science he represents.

In the U. S. Geological Survey we may misinterpret the facts at our command and thus reach unwarranted conclusions, but when, because of new facts or of a new viewpoint, we recognize an error, we intend to present the new opinion with the frankness that should ever characterize the search after truth.

If the simple table quoted by you from the Director's report for 1912 did not satisfy you as a fair presentation of the matter, you had only to look on the next page to find the more elaborate table, not reprinted by you though utilized in your argument, which table shows the sales at each acre price from $10 to $410. This table is brought forward a year and printed, on p. 148, in the 1913 report. Comparison of these tables shows that more than 80 per cent. of the sales for the intervening 12 months were at minimum prices, verifying the statement in the 1912 report that "purchases will continue to be made mainly at the minimum prices."

ACCURATE STATISTICS HARD TO CULL

It is difficult to cull from the voluminous and complex records of the General Land Office accurate statistics of coal-land entries and sales. Uncertainties as to what should be considered the actual date of sale, the cancellation of final certificates and even patents, and the necessity of assembling reports from the numerous registers and receivers, complicate matters. The Survey heretofore has compiled, as best it could, from the files of the General Land Office the records of sale for inclusion in the Director's annual report. This compilation has usually preceded that made by the Land Office for its own purposes. That, notwithstanding our care, these figures have later been found to differ from the final figures issued by the Commissioner is, of course, to be regretted, although these differences have not been regarded as a matter of importance.

The only difference that possibly could have misled the reader is the larger number of entries cited in the Survey table, plainly due to duplication in the effort to itemize the acreage sold at the different prices. As our conclusions have been based not upon a comparison of the number of entries but only upon the acreage sold, there is evidently not the intent in this oversight that you have charged.

THE DISCREPANCY BETWEEN LAND OFFICE AND SURVEY FIGURES

The Land Office figures, further, effectually dispose of any implication that the Survey has deceived the President and the public by an exaggeration of the actual number of sales or acreage or returns. For, as reported to you by the Commissioner of the General Land Office under date of Dec. 3, 1913, instead of 829 entries of 133,000 odd acres, bringing $2,461,000 odd, as set forth in the Survey's report, there were 940 entries of 146,246.79 acres which brought $2,780,283.10, during the period July 1, 1907, to June 30, 1912.

Finally, I believe that the figures presented in the two tables in my report for 1912, as well as those published by the Commissioner of the General Land Office—which, by the way, show a larger acreage sold during the fiscal year 1912-13 than during the preceding year—fully justify my statements that coal land has continued to sell at the new figures at a moderate rate, and one comparable with that of the earlier years, and that "these sales indicate that the suggestion once made that coal lands would not sell at the new figures was not well founded."

GEOLOGICAL SURVEY ONLY ADMINISTERS LAWS

Whether or not my interpretation of these facts agrees with yours may not be essential, but it is all-important that the available facts have been fairly presented by the Federal Bureau.

It will be regretted by all men who seek the truth that a journal of the standing which the COAL AGE should have, considers it advisable to inject, into what should be a friendly and fruitful discussion of a broad, national question, imputations against the honesty of those who are compelled to differ with it as to the proper solutions of that question. I am constrained to believe that you will find no support, as you deserve none, in the charges you have made.

So long as existing laws remain on the statute books, they must be administered, even though those who administer them may believe that a law expressing a different policy would be better.

HAS THE WESTERN OUTPUT SUFFERED?

The only other topic under discussion, for which I request further space in your columns, is the larger ques-

tion of how the coal-land policy has affected the price of coal to the consumer. Paralysis of the industry has been freely charged ever since 1906, but whether there has been any serious checking of production perhaps can be determined best by a comparison of the statistics for the years before and after the adoption of the present coal-land policy. These statistics, which are available to anyone in the Survey's annual volumes on the mineral resources of the United States, show, I believe, that the Rocky Mountain States have kept pace with the whole United States in coal production. The actual production in those States has increased from 14 million tons in 1901 to 22 million tons in 1906 and 28 million tons in 1912.

For the sake of clearness and simplicity, a table showing the percentage of total production in each of the four principal fields for the years 1901 to 1912 inclusive is presented:

BITUMINOUS COAL PRODUCTION, IN PERCENTAGE OF TOTAL, OF FOUR PRINCIPAL REGIONS, FOR SIX YEARS PREVIOUS TO ADOPTION OF PRESENT POLICY.

	1901	1902	1903	1904	1905	1906
Appalachian.....	66.7	66.60	65.64	65.56	67.49	68.10
Eastern Interior...	16.6	17.73	18.43	18.55	17.54	17.34
Western Interior..	8.7	7.97	8.20	8.34	7.38	6.73
Rocky Mountain..	6.2	6.21	6.01	5.85	6.13	6.44

SAME FOR SIX YEARS SUBSEQUENT TO ADOPTION OF PRESENT POLICY

	1907	1908	1909	1910	1911	1912
Appalachian.....	67.51	65.10	66.26	69.00	67.80	68.30
Eastern Interior...	18.13	19.78	18.85	17.41	18.49	18.45
Western Interior..	6.80	7.11	6.80	5.24	6.04	5.90
Rocky Mountain..	6.06	6.51	6.63	6.92	6.42	6.32

The shifting percentages from year to year in the several fields, apparent in the table, doubtless result from a complex group of conditions, hence it is rash to attribute too much influence to a single factor, such as the growth of corporate holdings, the decreased production of oil in the East as contrasted with the enormously increased production in the West, or the present plan of public coal-land valuation. Yet I venture to suggest that there is no essential difference between the curves for the Rocky Mountains and for the whole country.

Has the Price of Coal Increased Unduly?

Next, as to whether the coal-land valuation policy has raised the price of coal and resulted in hard times in the Western States: I do not recall that my reports have made any specific reference to coal prices, though elsewhere I have expressed my opinion that both now and in the future the consumer is protected by this policy. Here, again, however, it is best to present the available figures, from which anyone may draw his own conclusions. The following table gives the price per ton for the several coal-producing public-land states and the average rate for the United States as a whole, not including Pennsylvania anthracite.

PRICES IN THE PUBLIC COAL-LAND STATES COMPARED WITH THOSE IN THE WHOLE UNITED STATES

	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
Colorado.....	1.13	1.23	1.31	1.22	1.28	1.40	1.41	1.33	1.42	1.45	1.49
Idaho.....	2.50	3.10	3.95	3.03	3.93	4.10	4.02	4.27	3.92	2.68	3.14
Montana.....	1.65	1.64	1.61	1.72	1.77	1.94	1.96	1.97	1.82	1.79	1.82
New Mexico.....	1.43	1.37	1.31	1.33	1.34	1.46	1.37	1.29	1.39	1.44	1.42
North Dakota...	1.44	1.50	1.43	1.34	1.54	1.61	1.63	1.56	1.49	1.43	1.53
Oregon.....	2.44	2.43	2.18	2.58	2.66	2.34	2.74	2.69	3.48	2.32	2.60
Utah.....	1.14	1.20	1.30	1.35	1.36	1.52	1.69	1.66	1.68	1.69	1.67
Washington.....	1.72	1.69	1.63	1.79	1.80	2.09	2.21	2.54	2.50	2.29	2.39
Wyoming.....	1.18	1.24	1.30	1.31	1.31	1.56	1.62	1.55	1.55	1.56	1.58
Average for all of U.S.....	1.12	1.24	1.10	1.06	1.11	1.14	1.12	1.07	1.12	1.11	1.15

At first glance, the gain in price in 1912 over 1902, or in 1907 over 1906, might seem conclusive proof that classification had increased the sale price of coal in the West. A more careful study of the tables, and of known local conditions of markets and demand and comparison with changes in other fields, however, at once leads to the important query whether this change has been brought about by the change in the public-land policy. For example, in 1902, the price in Colorado, Utah and Wyoming, was from one to six cents above the average for the United States; in 1906, from 17 to 25c. above that average.

Classification Has Not Raised Prices

Classification certainly had nothing whatever to do with this increase in the price of coal. The same tendencies continued to 1912 would have given prices above those of that year. Further, it may be noticed that, in 1907, prices in the Western States jumped above those in 1906, in most cases nearly or quite to the price that they have held since. As 1907 was the year in which the new system was inaugurated, it might be argued that the jump in prices that year over those in 1906 was the direct result of the inauguration of the new system, even though, as a matter of fact, in the year 1907-08, a larger number of coal-land sales were recorded than in any of the previous 5 years.

On the other hand, a knowledge of the coal conditions which existed in the Western states, as well as over the country in general through the first 9 months of that year, I believe will fully account for the increased price, for during those months, as you will remember, the demand for coal ran the price up over the whole country. For example, in his 13th biennial report, the State coal mine inspector of Colorado has this to say:

The year 1907 was the most flourishing in the history of the coal business, both in the amount of tonnage produced and also in the number of new mines opened and equipped on a scale to meet a large demand for the product; 10,965,640 tons constituted the year's output, and 18 new mines, located in the various districts, were developed by a large expenditure of capital. . . . . During the earlier 9 months of 1907, the demand for all classes and grades of coals was probably the steadiest and best the State has ever known and the prices were exceptionally good. The warning sent out from Washington and by the various railroad companies, recommending the laying in of supplies of coal while they were easily obtained, together with the tide of prosperity increasing the business of all the industries requiring fuel at that time, was responsible for the unusual activity.

I fail to find any hint in the sentences quoted or elsewhere in the report of the mine inspector of Colorado for 1907 and 1908 that the higher prices were in any way due to the inauguration of the present policy of coal-land classification and valuation, and what is true in Colorado I think will be found true in the other states.

In a letter to the Hon. Edward T. Taylor, of Colorado, on this same subject, I stated as follows:

All the facts before me indicate that changes in coal prices in the public-land states are to be regarded as resulting not directly from any change in Government policy, but rather are controlled directly by the universal law of supply and demand. I have further made the comparison between conditions in the four Rocky Mountain States, New Mexico, Colorado, Wyoming and Montana, and their nearest neighbors on the east, where there are no coal lands in public ownership—Iowa, Kansas, Missouri and Arkansas. These latter States are fairly comparable with the Rocky Mountain States in total production, in general quality of coal, and especially in market conditions, inasmuch as particular markets are in fact served by some States in both groups.

Comparing the output of 1912 with that of the boom year of 1907, I note that in the case of the Rocky Mountain States there has been a considerable increase in production, while in the case of their eastern neighbors there has been a decreased output. In the matter of change in coal prices, each state of the eastern group shows a net advance rang-

ing from 3c. in Arkansas to 18c. in Iowa, the average net advance in the group being 13c. as against 7c. in the six public land States, or even a lowering in price of 5c. if the four Rocky Mountain States are taken alone.

Or, to put it another way, while in the boom year 1907, the average price of coal in the public-land states was 8c. lower than in their nearest eastern neighbors, last year the difference in favor of the public-land states was 14c. So that, as a matter of fact, coal was sold on the average 1 cent lower last year in the public-land states than it averaged in 1907 in the five coal States next east. I am forced to the conclusion that these facts completely refute the assertion that Federal landlordship has forced up the price of coal to the consumer.

I have also approached this same question from another angle. In considering the record of the 8 sales of public coal lands recorded in Colorado in ten months of the past fiscal year, I find that these current sales, though not large in acreage (1320 acres), are in fact sufficient to meet current fuel demands. The Survey is in possession of detailed information resulting from its classification work for seven of these eight entries.

I find that these lands purchased from the Government have a total content of 40 million tons, of which nearly 15 million tons are recoverable and available for mining under present-day conditions, and some 60 per cent. more recoverable, although at considerable depth, and therefore not regarded as now available. Inasmuch as the total mine production of coal in your State last year was less than 11 million tons, these purchases were sufficient to more than offset the current exhaustion of coal lands in private ownership. Moreover, the present holding of coal lands in your State by other than the Federal Government is so large that I would not expect the demand for coal land to be lively.

Administration Has Been Intellectually Honest

In conclusion, permit me to say that the facts to which reference has been made above are simply those which have convinced my associates and myself that the classification and valuation administration of the 1873 coal-land law has proved itself such as serves the people best. In coming to this conclusion, I believe that we have been intellectually honest. Our experience, however, which leads us to defend this policy has also convinced us that this 40-year-old law is far from adequate and that the results we seek can more directly and surely be attained by a lease law.

The Bicknell Explosion

On Dec. 29, 1913, an explosion occurred at the Indian Creek mine of the Bicknell field in the southwestern part of Indiana not far from the Wabash River. It killed only three miners, injured a fourth, and five narrowly escaped death but the explosion was of such a character that had the mine been working in full force the disaster would have measured up with the largest in the past year.

The regular fireboss, it is said, was sick and in his place an old miner went into the mine to make an inspection. He had not gone far when the other men who were working round the shaft heard a small explosion which was followed by a terrific dust explosion, which carried disaster to the top of the 275-ft. shaft. Even the tipple was damaged and some of the mine buildings.

All but the miner who set fire to the gas were swept into the sump below the shaft with a lot of loose timbers and mine cars. Several pumps were put out of commission and it was feared that as a result the men would be drowned. Four men managed to get out of the sump but Alexander Cowen who was pinned down by timbers was rescued only after seven hours had passed. Meanwhile, the water rose rapidly so that his head was but a few inches above its surface when he was rescued. So badly was the stairway in the air shaft destroyed by the explosion that it had to be largely rebuilt before it could be used to remove Cowan. The cage was entirely out of commission and consequently the work of rescue was seriously hampered.

Here's Luck

The trembling hand holds up the glass,
Along the bar the catchwords pass—
"Here's luck!"
Flushed faces flush a deeper red;
The whiskey mounting to the head
Stirs phantom hopes where hope is dead;
"Here's luck!"

"Here's luck!" cry those whose luck is blank;
Luck never found the man who drank,
"Here's luck!"
He drinks, and luck has passed along;
It has no place amid the throng
With maudlin burden for their song—
"Here's luck!"

To drink—to drug the active brain,
To make all will, all reason vain—
"Here's luck!"
What fools! Their feet in folly's way,
Carousing through the busy day,
To look within the glass and say,
"Here's luck!"

'Tis pluck wins luck—'twill never come
To those who dull their wits and thrum
"Here's luck!"
Luck? Look where will and reason reign,
Where health nor time is spent in vain;
If such a thing there be 'tis plain,
Here's luck!"

—Wex Jones, in New York "Evening Journal."

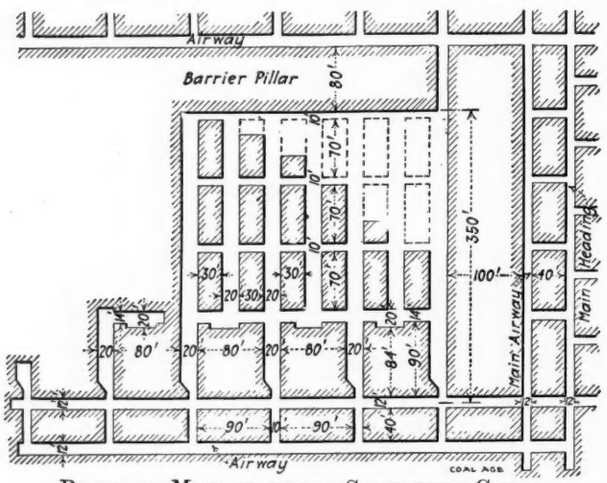
Discussion By Readers

Working Coal under Sandstone Cover

Letter No. 11—I was much interested in the recent discussion on this subject, bearing as it did on the recovery of pillar coal, and I desire to submit the following remarks:

In order to obtain the greatest amount of coal when drawing back pillars in the room-and-pillar method of working, the relative width of the rooms and pillars must be determined with reference to the thickness of cover; the nature, thickness and inclination of the seam; the character of the underlying and overlying strata; and the direction of the pillars with reference to the pitch. The length of the rooms as determining the time the pillars must stand should also be carefully considered.

Too small a ratio of width of pillar to width of opening will induce a "creep" or "squeeze." It may happen that the pillars will show no sign of weakness until the work of drawing back a range of pillars is in progress, when the strong sandstone roof will throw an excessive weight on the pillars and crush the coal unless suitable means be adopted to prevent this result.



PROPOSED METHOD UNDER SANDSTONE COVER

In case the entries have been driven to the boundary or limit and the room pillars have been left standing, in order to avoid the possible danger of a squeeze developing when the pillars are drawn, the work should be started at the inby end and proceed outward on the retreating plan. By adopting this method, less loss of coal will result and the cost of maintaining the roadways will be reduced to a minimum while the coal will be obtained in better condition. It is important to keep the line of pillar work uniformly straight and to avoid leaving any stumps of coal in the gob, because these would interfere with the uniform settlement of the overburden and cause trouble. Also, the work must proceed rapidly.

The accompanying sketch suggests a good method of providing ample protection for the main entries and cross-headings while these are being driven to the boundary. As shown in the figure, a flank pillar 100 ft. wide is left to protect the main airway, and a barrier pillar 80 ft. wide is also left between the head of the rooms and the airway above. The cross-heading from which the rooms are turned is protected by entry stumps formed by turning the rooms on 100-ft. centers. These are turned narrow for 5 or 6 yd., and then widened out to 20 ft. As illustrated, a cross-heading is started in the room, at a distance of 90 ft. from the entry. This is turned 14 ft. wide and widened out to 20 ft. on the lower side.

As further shown in the figure, the 80-ft. pillar left between consecutive rooms is then cut by driving a 20-ft. opening or room to the rise of this cross-heading. Crosscuts or breakthroughs are made at suitable distances in the remaining 30-ft. pillars.

This system has given good success in a seam having an average thickness of 4 to 5 ft., the coal being of medium hardness and overlaid with between 200 and 300 ft. of hard sandstone cover immediately above the coal. The seam was underlaid with a fireclay of medium hardness. The pitch of the seam varied from zero to 5 per cent.

BENJAMIN HARTILL.

Johnstown, Penn.

The Certificate Law

Letter No. 11—The question in reference to the interchange of certificates of competency issued in different states seems to have provoked quite a controversy. The suggestion does not appeal to me that a plan should be adopted by which a mine foreman or fireboss could be granted a certificate that would be recognized in every coal-producing state in the Union.

If a man is qualified to fill one of these positions in Tennessee, Alabama or any other state and desires to hold a similar position elsewhere, he should, in my opinion, be required to work a certain period in the new field, in order to acquaint himself with the existing conditions and the methods employed there to secure greater safety in mining. I regard this as absolutely necessary to make sure that he is not taking risks with the lives of miners that would be under his care.

I am certain that any ambitious man will keep himself posted, sufficiently at least to pass an examination in any state. As far as competency goes, if the candidate for a certificate cannot show that he is qualified by experience as well as by technical education, soberness, morality and truthfulness, he is a dangerous man to put in charge of a mine where he would be responsible for the lives and health of a large number of miners. The best and most competent mining men have accidents, but these are not as frequent as would be if our laws were less strict.

Every tub must stand on its own bottom; so every candidate must show his fitness before he can secure a certificate of competency. Our creed must be: *Safety first, last and always.* Until a man can show himself fit

and worthy to boss a mine, let him handle the pick and shovel and qualify himself by experience and study. Great mine disasters follow each other in such rapid succession, that we hardly recover from the shock of one when we are overwhelmed with the news of another. In my opinion, the solution of this great mystery and problem lies more underground than in the office.

A. H. STANSBERRY.

Oliver Springs, Tenn.

Letter No. 12—I have been interested in the discussion of the question of the advisability of establishing an interchange of certificates of competency for mine foremen and firebosses, between the different coal-producing states. This seems to me to be a most reasonable proposition and one that I can indorse.

It has been argued that conditions vary widely in the mines in different states, some mines generating gas in dangerous quantities, some having highly inflammable dust, and some seams pitching while others are flat. I would ask, How long would it take a competent experienced man who had his papers of qualification, to acquaint himself with these conditions as they exist? I venture the opinion that, in a short time, he would be master of the situation, because the *principles* of mining are everywhere the same.

It must be remembered that conditions vary widely even in the same state. For example, in Illinois, some mines are worked longwall and others on the room-and-pillar system; some mines generate dangerous quantities of gas while, in others, gas is almost wholly unknown, except for an occasional feeder that causes no alarm. Many of the mines in southern Illinois, particularly Franklin County, are troubled with dangerous quantities of gas and inflammable dust. In some of the mines of the state, the seam is overlaid with a rock roof where a prop is seldom stood. In the same seam, within a few miles there is 42 ft. of soapstone between the coal and the rock, requiring the use of heavy crossbars spaced from 2 to 2½ ft. apart in the entries.

Now, considering this question, with respect to the state of Illinois, the candidate for a certificate of competency is examined as to his knowledge of conditions and methods of mining applicable to the mines of Illinois. The examination may thus often relate to conditions the candidate has never experienced; but he cannot obtain his papers certifying to his competency until he has satisfied the board that he has the required knowledge. A longwall man, having passed this examination, is certified as competent to take charge of a mine worked on the room-and-pillar system. In like manner, men from districts free from gas, but who succeed in passing the examination, are certified as being fitted to hold official positions in mines generating gas. In other words, the scope of the examination is made broad enough to cover all these conditions existing in the state.

I see no reason, therefore, why the requirements in examination cannot be extended to cover the conditions in other states, so that certificates could be granted successful candidates that would be good in any of the coal-producing states in this country. I fail to see why we should be behind Great Britain, in this respect, since the conditions there are as diversified as anywhere in this country.

Compare, for example, the South-Wales coal field with that of the Forest of Dean in England, these two fields being separated by about 20 miles. In the Forest-of-Dean coal field, gas is almost wholly unknown. About 14 years ago, many of the mines in this field were ventilated by furnace. On the other hand, the mines of South Wales give off as much gas as any mines in the world and the dust is highly explosive. Even under these diverse conditions, however, a certificate granted at Bristol, England, has the same force and value as a certificate granted at Cardiff, Wales. In fact, a certificate granted a candidate at an examination anywhere in Great Britain entitles the holder to fill the same position in any coal mine in the United Kingdom. The standard of examination is the same throughout the Kingdom; the subjects are the same, and the candidate must be thoroughly versed in these subjects before he is granted a certificate.

I would argue, therefore, for a universal standard in examination, broad enough to cover all conditions common to coal mining in this country and high enough to secure the required degree of proficiency and insure the safe operation of the mine. On some accounts, the present system of examination and certification is absurd; it is needlessly burdensome and expensive to the state, all of which could be avoided and the system vastly improved by standardization and interstate agreement.

W. L. MORGAN,
Ex-State Mine Inspector.

East St. Louis, Ill.

Letter No. 13—A nation-wide certificate or a national certificate law, based upon the conditions assumed in this discussion, in my opinion, would be unjust and productive of harm. Every commonwealth has its own peculiar constitutional formation based upon the physical, social, industrial and political conditions existing within the state. The object of every state constitution is or should be to secure to each individual citizen of the state the inalienable right and privileges to which he is the rightful heir; and to require of him the performance of such duties as the safety and progress of the state demand.

While not an advocate of state rights, in general, I am a strong supporter of state rights in particular. I believe it to be the right and duty of every commonwealth to enact such statutes as will protect its citizens in their vocations and social relations and afford them every facility not inimical to the public good, which they as citizens have a right to demand.

The industry of coal mining has advanced by leaps and bounds, from the class of unskilled labor to a rank among the professions requiring practical and theoretical knowledge and scientific means and methods. Each state has established its own standard of competency based upon its own peculiar conditions, which determine the qualifications required of all candidates for the positions of mine foreman (manager) or fireboss (mine examiner). We may ask, Would not any man who had qualified himself for such position consider it an act of injustice were a citizen of another state permitted to come into competition with him without having first shown his competency by passing the state examination?

I do not regard it as a logical argument to say that the general conditions of mining are so similar in the different states, that when a man is legally qualified in one state, he is like qualified in another state. It would be just as logical to say that a practical miner, who may be as competent to take charge of the mine work as his

foreman but who, lacking the technical knowledge necessary to pass the examination required by law, is not as qualified to assume the responsibilities of the position of mine foreman as a legally certificated man. The certificate granted a successful candidate is the state's seal of approval of the test of his competency.

It is well to observe that the phrase "legally qualified" does not necessarily mean "competent." A candidate is *qualified* if he measures up to the standard of the examination, but *competency* is only determined by the results produced in actual service. The difference in the meaning of these terms is illustrated by the fact that many certified foremen and firebosses, though "legally qualified," are wholly incompetent for the performance of their duties in the mine. This is the result of an unfair examination or the employment of dishonest means and methods to secure the coveted certificate. To broaden the field of operation of such certified men, by a universal certificate law, would unquestionably be productive of harm.

I question the truth of the statement that mine foremen, as a class, have their time so fully occupied as to afford no opportunity for study. Personally, I know this is not true. Too frequently, the certificate is regarded as a guarantee of no further need of study. The rightful possessor of a certificate realizes that it has required effort and sacrifice on his part to obtain the same, and it will require greater effort and sacrifice to maintain its possession. In general, the work of preparation is not as laborious as the later work made necessary by the growing responsibilities of the position. Success in any business or profession is only attained by continually striving.

My judgment is that no qualified or thoroughly competent man would consider it a hardship or an injustice to be required to submit to the standard of examination in another state in which he seeks employment as mine foreman or fireboss.

In this connection, however, I would earnestly urge that every state examination should be open to any citizen of the United States, who should be subject to no other conditions than those of experience and character.

I. C. PARFITT.

Jerome, Penn.

Working Coal under Watery Strata

Letter No. 1—Replying to the request for suggestions, in reference to working coal under watery strata, COAL AGE, Jan. 3, p. 30, I want to say that the conditions described in this inquiry are peculiarly difficult to contend with in the mining of coal.

Unless a suitable method of mining is adopted at the start and the mine laid out in accordance therewith, much trouble is liable to arise from a sudden inflow of water into the mine workings. This is more liable to occur in the winter than in the summer time. It is also absolutely necessary in the development of such a mine, to drive all openings as narrow as possible and to leave ample pillars for the proper support of the overlying strata. In this case, much will depend on the thickness of the fireclay stratum interlaid with the shale and slate immediately above the coal and beneath the water-bearing sandrock.

In dealing with underground water in mining, it is necessary to study closely the character of the strata, in respect to their being pervious to water or otherwise. Under the action of gravity, surface water sinks into the soil and penetrates the underlying rocks to various depths, according to the character and inclination of the strata. Underground water may be considered in respect to two zones. The lower zone being more or less permanent, its upper surface marks what is generally known as the "water level." The saturation of the upper zone depends primarily on climatic conditions, as marked by the wet and dry seasons.

The water level, or upper limit of the permanent zone of saturation underground, in any district, is therefore an important factor in mining. While mine workings lying above this level may only be seriously troubled with water during wet seasons, workings below the water level will generally be subject to a more or less constant flow of water, for which ample provision must be made in the operation of the mine.

In considering rock strata with respect to the flow of water through them, it is observed that the clays and certain massive and igneous rocks are largely or wholly impervious to water, while other strata, such as sandstones, shales and some slates permit, in varying degree, the passage of water through them; and many of these strata absorb and hold large quantities of water.

A coal seam overlaid by a heavy bed of shale free from faults is quite likely to have a dry roof, although the shale itself may be saturated with water held in the pores of the rock. However, if the shale is much broken or traversed by faults or thins out in places and is overlaid with a water-bearing sandstone, there is every possibility of a sudden inflow of water occurring.

Another important effect of underground water that must be considered in mining, is the enormous pressure exerted by the water on the mine roof. Extra caution should be taken to avoid the breaking of the roof, which would be accompanied by an inflow of water. The pressure of the water may even be such as to cause the bottom to heave, in the workings. In all such cases, the work of drawing pillars should be delayed, until such time as the pillars can be drawn rapidly in sections of the mine where ample provisions for drainage are provided. The work of drawing the pillars should, of course, be commenced at the boundary and proceed outward on the retreating system.

I recall an instance, in my own experience, where the roof was broken in the first working, in a mine under conditions such as these. The result was that we had a very wet mine in the winter season, which increased the difficulty of driving the entries. In the summer season, however, the mine was practically dry.

Replying, then, to the questions asked by Mr. MacPhail, I would say that if proper precautions are taken in the development of the mine, there is no doubt in my mind but that 85 per cent. of the coal can be taken out. The amount of coal left in the first working of a mine varies widely under different conditions. The best practice is to leave ample pillars in the first workings in order to minimize the danger from squeeze and inflow of water through the breaking of the roof.

Many of the mines in Pennsylvania are taking out but one-third of the coal in the first workings, leaving two-thirds of the coal as pillars to be taken out later when

drawing back the work, previous to abandoning the mine. Many mines in the Connellsville region of western Pennsylvania take out but one-fifth to one-sixth of the coal in the first workings, driving only narrow stalls and drawing back the wide pillars between them.

It is, therefore, impossible to give exact rules for determining the proper size of pillars to support the overlying strata, as no rule is of universal application, in this regard. Each mine is a special problem that must be studied in the light of successful practice in the same field or in mines worked under similar conditions. Such practice, however, should not be followed blindly. Failure often results from copying the methods employed in other mines, without carefully considering the relative conditions. Because a certain system has worked successfully in one region is no indication that it will be like successful in another. It is of the greatest benefit, however, to study carefully plans that have proved successful and others that have failed.

In my opinion, the same amount of water may be expected in the hoisting shaft to be sunk 300 ft. from the airshaft. Also, the breaking of the roof in different parts of the mine may be expected to result, more or less, in the same inflow of water.

GEORGE STOCKDALE.

Percy, Penn.

Coal Production in Saskatchewan

In the issue of COAL AGE, Jan. 10, p. 67, an article entitled "Foreign Coal Production, Saskatchewan," by Frank B. Smith, states as follows:

> Up to the year 1905 all the published records of coal production in the province were included in the statistics of the Public Works of the North West Territories.

and further on:

> The returns made to the Government in 1905 showed only 60,000 tons mined, but there is no doubt that more coal was produced.

As it might be inferred from these statements that there is still no published record of the production of coal previous to 1905 in that portion of Canada now known as Saskatchewan, I would call attention to the fact that apparently Mr. Smith has overlooked the annual statistical reports of the Canadian Department of Mines. The statistical division of this department has published a record of the production of coal in the territory included within the present boundaries of the Province of Saskatchewan since 1890, these records having been obtained direct from the mine operators. The production for the year 1905 is shown in the report as 107,596 tons.

JOHN MCLEISH,
Chief of Division of Mineral Resources and Statistics.
Ottawa, Canada.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Effective Depth of Air Column—It has been shown that in all shaft ventilation the effective "head of air column" (D) is the difference in elevation of the top of the upcast and the bottom of the downcast. This applies equally to all forms of natural, furnace or fan ventilation, in shaft mines, where a positive or negative air column may exist.

Likewise, in drift or slope mines, the same law will apply, except where a long slope causes an appreciable rise in the temperature of the downcast air; and in the furnace ventilation of a slope mine. In either of these two cases, three temperatures may be concerned: (1) average upcast temperature in the shaft; (2) average downcast temperature in the slope; (3) outside temperature.

In furnace ventilation, in inclined seams, also, three temperatures must be considered: (1) average temperature of the furnace (upcast) shaft; (2) mine temperature, rise or dip of seam; (3) average downcast temperature. In a few cases, a fourth (4) outside temperature may require consideration. In all cases where more than two temperatures are concerned it is necessary to calculate the column for each separate temperature and corresponding depth and take their algebraic sum.

In practice, the arrangement of the circulation in the mine may be such that the rise or dip column is eliminated by a balance of intake and return columns of equal temperature.

PROBLEMS

Example—A shaft mine, in a level seam, is ventilated by a furnace. The furnace shaft is 900 ft. deep and has an average temperature of 300 deg. F.; the downcast shaft is 600 ft. deep. Calculate the air column producing circulation in this mine and the corresponding ventilating pressure and water gage when the temperature of the outside air is 20 deg. F.

Solution—The effective head of air, in this case, is D = 900 ft. and, assuming that the temperature of the downcast shaft is practically the same as that of the outside air, which is commonly true, the air column, expressed in terms of the downcast air, is

$$h_d = \frac{(T - t)\,D}{460 + T} = \frac{(300 - 20)\,900}{460 + 300} = \frac{280 \times 900}{760} = 331.5\ ft.$$

Expressed in terms of the upcast air the air column, in this mine, is

$$h_u = \frac{(T - t)\,D}{460 + t} = \frac{(300 - 20)\,900}{460 + 20} = \frac{280 \times 900}{480} = 525\ ft.$$

The pressure is found by multiplying either of these air columns by the corresponding weight of downcast or upcast air.

Thus (downcast), $p = \frac{1.3273 \times 30}{460 + 20} \times 331.5 = 27.5$ *lb. per sq.ft.*

Or (upcast), $p = \frac{1.3273 \times 30}{460 + 300} \times 525 = 27.5$ *lb. per sq.ft.*

The corresponding water gage is, then,

w. g. = 27.5 ÷ 5.2 = 5.3 in., nearly

The Coal Age Pocket Book

Example—A slope mine is ventilated by means of a blowing or force fan located at the top of an air shaft 800 ft. deep. The slope is the main return airway and the elevation at its mouth is 275 ft. below that of the top of the air shaft. What natural air column exists, assuming the temperature of the mine is 60 deg. and that of the outside air 10 deg. below zero (— 10° F.); and is this positive or negative?

Solution—The effective head of air, in this case, is D = 800 — 275 = 525 ft.; because the downcast fan shaft has the same temperature as the outside air column, which therefore balances 275 ft. of the shaft column. The downcast air in the shaft being colder and heavier than the upcast or return air in the slope, the resulting air column assists the circulation produced by the fan and is, therefore, a positive air column. It is

$$h_d = \frac{60 - (-10) \times 525}{460 + 60} = \frac{(60 + 10)\,525}{520} = \frac{70 \times 525}{520} = 70.67\ ft.$$

This air column is in terms of the downcast air, which weighs, assuming a barometric pressure B = 30 in.,

$$w_d = \frac{1.3273 \times 30}{460 + (-10)} = \frac{39.819}{450} = 0.0885\ lb., nearly$$

The natural pressure due to this air column is then

$$p_n = 70.67 \times 0.0885 = 6.25\ lb.\ per\ sq.ft.$$

Ques.—If the fan, in this example, were to be reversed so as to exhaust air from the mine, thereby making the slope the intake and the fan shaft the upcast, what air column would result, if the average slope temperature is 40° F.?

Ans.—In this case, three air columns exist, two assisting and one opposing the circulation induced by the fan. They are as follows:

Outside column (*positive*), $w_o = \frac{1.3273 \times 30}{460 - 10} \times 275$

Slope column (*positive*), $w = \frac{1.3273 \times 30}{460 + 40} \times 525$

Shaft column (*negative*), $w_u = \frac{1.3273 \times 30}{460 + 60} \times 800$

The net air column, expressed in terms of say the slope air, is now found by dividing the algebraic sum of these positive (+) and negative (—) columns by the weight of 1 cu.ft. of the slope air, which gives after simplifying,

$$h_s = (460 + 40)\left(\frac{275}{460 - 10} + \frac{525}{460 + 40} - \frac{800}{460 + 60}\right)$$

$$= 500\left(\frac{275}{450} + \frac{525}{500} - \frac{800}{520}\right) = 61.3\ ft.\ (positive)$$

The weight of 1 cu.ft. of slope air is

$$w_s = \frac{1.3273 \times 30}{460 + 40} = \frac{39.819}{500} = 0.0796\ lb.$$

The natural pressure assisting the circulation is then

$$p_n = 61.3 \times 0.0796 = 4.88\ lb.\ per\ sq.ft.$$

Inquiries of General Interest

Ventilation in Airways

It is possible, in the ventilation of a mine, to have the same velocity of air current at the face of the intake entry as at the main entrance? We have been discussing this point and, while one claims that the resistance of the airway would decrease the velocity of the air current, another claims that the volume of air passing the head of the entry must be the same as that entering the mine, providing, of course, there is no leakage of air through the stoppings. It is also claimed that the velocity must remain the same under the same pressure. We are considering a single straight entry having no leakage of air and no butt headings to ventilate.

I want also to ask if it is possible to have more air on the return than on the intake entry in a mine; and how does the warmer temperature of the mine affect the velocity of the air current?

J. H. FRAZIER.

California, Penn.

Assuming that the sectional area of the entry is the same at the face of the heading as at the main entrance and that there is no change in the temperature of the air, there would be no change in the velocity of the air current.

The *weight of air* passing into the mine, in a given time (pounds per minute), is the same as the weight of air passing out of the mine or the weight of air passing any point in the entries, in the same time. This is true, regardless of the mine resistance.

But, the mine resistance developed in any circulation of air depends on the rubbing surface and the square of the velocity of the air current. This is the total mine resistance or the total resistance of the airway; and the pressure due to this resistance is the pressure per square foot, producing the ciculation. It is the difference of pressure at the mouth of the mine or airway, between the intake and return.

It is important to observe that this difference of pressure between the intake and return decreases regularly from the mouth to the face of the pair of headings, where the difference is zero. The difference of pressure between the intake and return is measured by a water gage placed on a brattice in the crosscut. It is evident that the water-gage reading will be greatest in the first crosscut, at the mouth of the mine, and will be practically zero in the next to the last crosscut, at the face of the heading; but, as stated, the velocity of the air current is constant at all points of the airway, for the same sectional area and temperature.

In answer to the second question: For the same sectional area of the airway, a constant velocity will produce a constant quantity of air in circulation. But any change of temperature will cause a corresponding change in the volume of the air current; and, consequently, a like change in the velocity of the current. As the temperature rises, the air expands in volume. Therefore, the volume of air in circulation varies as the absolute temperature; and, for the same sectional area of the airway, the velocity of the current varies in the same ratio.

For example, a current of 10,000 cu.ft. per min. passing into a mine, at a temperature of 32 deg. F., will be increased on the return airway where the temperature is 70 deg. F., to a volume of

$$10{,}000\,\frac{460+70}{460+32}=\frac{10{,}000\times 530}{492}=10{,}772\ cu.ft.\ per\ min.$$

If the sectional area of the airway remains constant, the velocity will be increased in the same ratio. If the sectional area of the airway is 50 sq.ft., the original velocity is 10,000 ÷ 50 = 200 ft. per min. The increased velocity due to the rise of the temperature is then

$$\frac{200\times 530}{492}=215.44\ ft.\ per\ min.$$

Fan Ventilation

I have recently been studying a difficult problem and have been unable to obtain any satisfactory information from other foremen and superintendents whom I have consulted. Their views mostly contradict my own conclusions.

The situation is as follows: Having charge of a mine that is well developed, and ventilated by a fan that is not large enough to give the required quantity of air, I propose to install another fan on the other side of the mine. Both of these fans will blow air into the mine by separate air courses, the one on the right and the other on the left side of the mine; and the plan is to bring the two currents together into a main-return airway about a mile from the mouth of the mine. In other words, both fans will ventilate separate sections of the mine but use the same return airway for a distance of about a mile, from the working face back to the mouth of the mine.

The question is, will both of these fans work successfully? If you can answer this question, or if some of the readers of COAL AGE will give their experience, it will greatly assist me, and I shall appreciate the favor.

D. J. HOPKINS,
Foreman, Mine No. 2.

Madera, Penn.

The plan proposed by correspondent is entirely practicable. Both fans being blowers or force fans, there will be no difficulty experienced; but each will perform its proper work. It may be necessary, however, to install a regulator at the inby end of one of these airways or sections of the mine, in order to properly balance the work of the ventilators and secure the proper distribution of the air produced in the two sections.

It is always an error to undertake to run two centrifugal fans in tandem; that is to say, to operate one fan as a blower and the second fan as an exhaust on the same circulation. In that case, one or the other of the two fans will perform the entire work, and the air current will be carried through the other fan by the pressure maintained by the first.

Examination Questions

Selected Fireboss Questions

Ques.—A mine is producing 40,000 cu.ft. of air per min. with 10 hp.; what horsepower will be required to produce 75,000 cu.ft. per min., in the same mine?

Ans.—In any mine or airway, the power producing the circulation varies as the cube of the quantity; in other words, the power ratio is equal to the cube of the quantity ratio. Calling the required power x

$$\frac{x}{10} = \left(\frac{75{,}000}{40{,}000}\right)^3 = \left(\frac{15}{8}\right)^3 = \frac{3375}{512} = 6.59$$

$$x = 10 \times 6.59 = 65.9, \textit{ say } 66 \textit{ hp.}$$

Ques.—With a water gage of 0.4 in., a ventilating fan is making 65 r.p.m. and producing 36,000 cu.ft. of air per min.; what quantity of air will be produced under a water gage of 0.6 in.?

Ans.—The rise in water gage from 0.4 to 0.6 in. may result from an increase in the mine resistance, due to a fall of roof or extension of the airways; or the same rise of water gage may be the result of increasing the power and speed of the fan. The question does not specify the cause of the rise in pressure.

Assuming, first, the power applied to the fan shaft and the efficiency of the fan remain constant, the power on the air will be constant. In this case, the quantity varies inversely as the unit pressure or water gage. In other words, the quantity ratio is equal to the inverse water-gage ratio. Thus, calling the required quantity of air x

$$\frac{x}{36{,}000} = \frac{0.4}{0.6} = \frac{2}{3}$$

$$x = 36{,}000 \times \tfrac{2}{3} = 24{,}000 \textit{ cu.ft. per min.}$$

But assuming, on the other hand, that the rise in water gage is due to an increase of power and a consequent increase in the speed of the fan, the quantity of air in circulation in a given mine or airway will then vary as the square root of the pressure or water gage. In other words, the quantity ratio is equal to the square root of the water-gage ratio. Or,

$$\frac{x}{36{,}000} = \sqrt{\frac{0.6}{0.4}} = \sqrt{1.5} = 1.2247$$

$$x = 36{,}000 \times 1.2247 = \textit{say } 44{,}000 \textit{ cu.ft. per min.}$$

Ques.—The hand on an anemometer turns around 3.25 times in one minute. The airway is 6.25x8.5 ft. What is the velocity of the air current and the quantity of air passing, allowing 3 per cent. for the resistance of the anemometer?

Ans.—The sectional area of the airway is $6.25 \times 8.5 = 53.125$ sq.ft. In the Biram anemometer, one revolution of the large hand corresponds to 100 ft. of air travel, disregarding the error of the instrument. In the given case, the air is traveling at the rate of 325 ft. per min., as indicated by the instrument. Allowing 3 per cent. for resistance, the indicated velocity is 97 per cent. of the actual, which makes the velocity of the air current, in this case, $325 \div 0.97 = 335+$ ft. per min. The volume of air in circulation is then $53.125 \times 335 =$ say 17,800 cu.ft. per min.

Ques.—Where would you expect to find firedamp in a mine?

Ans.—Firedamp may generally be expected to be found in the air current passing the face of a heading or other working place generating a considerable quantity of marsh gas, sufficient to render the passing volume of air inflammable or explosive. Again, firedamp may be expected to be found at the face of a rise heading or chamber that is poorly ventilated, or where the air current is not properly directed so as to sweep the face of the heading. Firedamp also accumulates in pockets or cavities in the roof or other void places not reached by the air current and in all rise workings.

Ques.—If the temperature of the air current passing in a mine is 60 deg. F., and its velocity 300 ft. per min., the sectional area of the airway being 50 sq.ft., what weight of air is traveling per minute?

Ans.—The volume of air passing in this airway is $q = av = 50 \times 300 = 15{,}000$ cu.ft. per min. Assuming a barometric pressure of 30 in., the weight of air passing in this case

$$W = \frac{1.3273 \times 30}{460 + 60} \times 15{,}000 = 1148+ \textit{ lb. per min.}$$

Ques.—What effect does an atmosphere containing explosive gas have on a safety lamp?

Ans.—The effect will depend on the degree of explosiveness of the firedamp mixture and the character of the mixed gases. If the firedamp consists principally of marsh gas and air mixed in such proportion that the mixture has not yet reached the lower explosive point but is merely inflammable, the effect is to cause a disturbed condition of the flame of the lamp, which may reach upward, flutter and become enlarged in volume and finally fill the entire gauze of the lamp.

As more gas is added and the mixture becomes explosive and nears the maximum explosive point, small explosions and sharp cracklings are apt to occur within the lamp when the latter is first introduced into such gas. The moment of greatest danger is when the lamp is being removed from such a mixture of gas and air. The entrance of fresh air into the combustion chamber of the lamp, under these conditions, is apt to cause an explosion within the chimney that will force the flame through the gauze. The lamp should be removed slowly but promptly from such a mixture.

Ques.—Explain, briefly, what is meant by a "dead hole" and what is a "windy shot"?

Ans.—A dead hole is a hole that is drilled more or less perpendicular to the face of the coal and has no opportunity to work so that the charge can free itself. Any shot that is thus bound is spoken of as a "dead hole."

A windy shot is one where the energy of the exploding charge is spent largely on the air, producing a heavy concussion of the atmosphere in the immediate vicinity of the blast.

Coal and Coke News

Washington, D. C.

The Interstate Commerce Commission has handed down a decision in the case of "investigation and suspension docket No. 242" which involves a so called "Chicago switching charge." In this decision a proposed increase in rates on interstate shipments of coal from Chicago, Ill., to Ravenswood, Ill., and the reduction of the amount of absorption on such shipments by line carriers were found not to be justified, and the suspended tariffs were required to be withdrawn. The case in question is another of the series of switching charge cases that have been before the Commission for some time past.

On anthracite coal absorption of the switching charges of the Chicago & Northwestern to both Rose Hill and Ravenswood was provided to the extent of $4 per car, regardless of weight, the difference in rate being the result of the spread in the locals. In an attempted compliance with the order of the Commission, in the case referred to, instead of lowering the Rose Hill rate, the respondents raised the Ravenswood local to 25 cents, and at the same time the line-haul carriers filed tariff canceling the through rate and reducing the absorption on bituminous coal from $6 to $4 per car, the effect of all of which was to put Ravenswood on a basis of 15 cents and 5 cents per net ton higher on bituminous and anthracite respectively, than points immediately south of and in competition with it, by means of wagon and motor-truck deliveries.

In this situation Zipf Brothers Coal Co., located at Ravenswood, protested against the new tariffs becoming effective, alleging that they would result in an illegal discrimination, in that their immediate competitors, of which there were many, would be upon a basis of 15 cents per net ton lower, which would practically eliminate the protestant from the business. It appears that the chief interest of this concern is with the soft-coal rates. Complaint as to the proposed rates was also made by the Chicago Coal Dealers' Association.

"The respondents," says the decision, "seek to justify the manner in which they attempt to comply with the Commission's order in the Rose Hill case by asserting that if they should reduce the Rose Hill rate to within 5 cents of the present Ravenswood rate, it would result in too great a spread between Rose Hill and Rogers Park, and other points immediately north and subject them to the same complaint they encountered in the Rose Hill and the instant case.

This argument, however, is extraneous to the issue, which is whether the proposed rates to Ravenswood are reasonable. The fact that another complaint might possibly arise out of the same general situation is not a controlling factor in the determination of that question, as cases of alleged undue preference or prejudice must be adjudged upon their respective merits.

To substantiate the reasonableness of the advanced rates respondents offer testimony tending to show that what is known as the Chicago switching district really ends at Deering, though the map filed with the Lowrey tariff, to which respondents are parties, indicates that only the inner zone of the switching district terminates at or near Deering while the outer zone extends much farther north and takes in Ravenswood and other points several miles above Ravenswood."

Arguments on Proposed Alaskan Railway

The principal subject of interest during the past week with respect to mining developments has been the discussion of the bill for constructing a government railway in Alaska intended to open up the coal region of that territory as well as to render the copper and gold mining sections of the peninsula more accessible.

Much of the discussion has been of a semi-political type designed to show that the failure to develop the territory by private capital was due to unreadiness on the part of certain capitalistic interests to run counter to the wishes of others which have obtained a strong foothold in Alaska and are in position to defend themselves.

Another large division of the discussion has dealt with purely technical railroad questions, involving the routes that could be followed in reaching the districts that are intended to be opened up. All of this part of the debate has been of purely technical significance. In addition, however, there has been some development of information with regard to the probable effect of the new road upon mining conditions and the circumstances under which freight is now carried and would be carried in the event of the enactment of the legislation.

It is alleged that under existing conditions it costs about $150 per ton to get freight to Fairbanks whereas under the new plan with a Government road it would be not over $27. This is the general drift of the argument in support of the new measure.

HARRISBURG, PENN.

The Interstate Commerce Commission on Jan. 14, resumed its inquiry into the anthracite coal industry with reference to rates and practices existing among the railroads and coal companies. The hearings were begun last November, and were suspended until now, because of the death of Commissioner Marble at Washington, and Commissioner McChord, presided at the present hearing.

The principal questions which the Commission sought to determine by its investigation were:

"Are the carriers directly engaged in the mining and sale of coal, and are these big railroad companies sufficiently separated from the producers?

"Are the rates, rules and practices governing the transportation of coal reasonable?"

According to testimony presented during the hearings, efforts were made to show that the carriers had derived earnings from freights and in return made certain concessions in interest charges, royalties, rentals and in other ways to their own companies, while competitors were forced to pay big freight rates without receiving any concessions whatever.

The interlocking directorates of the Delaware & Hudson R.R. Co., and the Delaware & Hudson Coal Co. it was brought out, were responsible for the attitude taken by the latter company and also dictated its policy toward independent coal companies.

The Reading Co., it was pointed out, owns the capital stock of both the Philadelphia & Reading Coal & Iron Co., and the Philadelphia & Reading Ry. Co., thus forming a holding company and two operating companies. It was also shown that the Reading Co. is financed by $100,000,000 or more of 4 per cent. general mortgage bonds. The holding company also owns $20,000,000 bonds of the Philadelphia & Reading Ry. Co., and the later is obliged to pay 6 per cent. to the holding company, making an additional 2 per cent. The equipment used by the railway company is owned by the Reading Co., and it must pay 8 per cent., which was paid monthly in advance instead of semi-annually in arrears.

The question of interlocking directorates was also touched on in the testimony given by G. H. Ross, vice-president of the Susquehanna Coal Co., which brought out the fact that its subsidiary companies were supposed to pay royalties of from 20 to 28 cents a ton on coal mined on land leased by the railroad to the coal company, but that these royalties had never been paid. That two subsidiary companies of the Susquehanna leased land from the Northern Central R.R. and now owed $6,000,000, but that interest was never paid before 1908, and has been paid since at the rate of from 5 to 6 per cent.

Evidence that the Delaware, Lackawanna & Western R.R. Co., had been lax in its methods of renting property to the Delaware, Lackawanna & Western Coal Co., was obtained from E. E. Loomis, vice-president of the railroad company and president of the coal company. It was brought out that the railroad company is receiving a fair rental for property leased in Buffalo. A quantity of the coal company stock is owned by some of the directors of the railroad it was stated. It was also said that the coal company might have profited to the extent of $112,000 if the coal taken over from the railroad company at the time of the reorganization in 1908 had been purchased by careful inventory of the stored material. A book inventory only was taken, and by this system the coal company lost money on the transaction.

The auditor of the Lackawanna company admitted exchange shipments of coal between his company and the Central Railroad of New Jersey, but that this arrangement was reciprocal, even though contrary to the published traiff rates of the railroad company.

Concerning the storage facilities offered to competitors of the Lackawanna company, it was brought out, that unlimited detention of coal on cars was allowed without demurrage charges to all shippers, but it later developed that the only

shipper having available facilities for free storage of coal on cars is the Delaware, Lackawanna & Western Coal Co., but by pooling their interests, the independent operators might store their product as cheaply as the Lackawanna company.

Testimony on Unpublished Rates

Witnesses were examined with regard to allowances that had been made to companies, and which had not been published in the rates filed with the Commerce Commission. This allowance of from 10 to 15 cents a ton permitted to railroad companies which hauled coal after it reached the trestles and piers to which it was assigned has been stopped recently. This special rate was known as the "Penn Haven rate." The largest allowances were those permitted to the Lehigh Coal & Navigation Co., for its service over the "laterals," which means the special short-cut tracks from the collieries to the nearest railroad center or distributing point. The Lehigh Navigation Co. it was brought out transported much of its coal over these laterals, the allowance to the coal companies on this amounted often to as much as 30 cents a gross ton.

It was brought out by the general coal agent of the Lehigh Coal & Navigation Co., that this company was prevented for many years from entering the Western coal market through hindrance by the Reading Ry. It was also shown that a daily report of all coal, either anthracite or bituminous, transferred to vessels for shipment to New England and other points, is sent to the general sales agent of the Reading Coal & Iron Co., whether the coal belonged to the Reading company or to other shippers.

R. D. Rickard, secretary and treasurer of the New York, Ontario & Western R.R., testified that the Scranton Coal Co., and the Elk Hill Coal & Iron Co., both owned by the Ontario people have been operated in the last few years at a loss and that both concerns failed to pay interest on second mortgages held by the railroad company.

The railroads will have an opportunity to present their side before any decision is handed down by the commission, which adjoined on the 17th, for six or seven weeks, so that the railroads may have an opportunity to prepare their evidence.

PENNSYLVANIA

Anthracite

Harrisburg—It is thought that the next legislature will be asked for an appropriation to establish a safety station similar to the one maintained at Pittsburgh by the United States Government. This request will be the outcome of a recent conference between James E. Roderick, chief of the State Department of Mines, and Dr. Holmes, of the U. S. Bureau of Mines.

Plymouth—The double frame building occupied by Lewis Ryzdewski, located on Vine St., began settling into the workings of the Plymouth Coal Co., on Saturday, Jan. 10, and, on the morning of Jan. 13, had practically disappeared, only the roof being visible from the street.

Wilkes-Barre—Judge Fuller in rendering an opinion for the bench on Jan. 19 established the legality of the 1913 assessment which was attacked by the coal companies. Efforts had been made to set aside this assessment on the ground that it was improperly made, and that the valuation of $250 per foot-acre was unfair and inequitable. The decision in question asserts that the assessment was legally and fairly made, upholds the $250 assessment and leaves no apparent loophole of escape to the coal companies.

Hazleton—The G. B. Markle Coal Co. which has been running a special train between Hazleton and Jeddo for its employees, since the start of the trolley strike in Hazleton, has decided that hereafter the workers must pay five cents each way. The coal company contends that the train is costing $300 a day, and that the miners should defray part of the expenses.

Pittston—One man was killed and two others injured recently by an explosion of gas in No. 17 shaft, Pennsylvania Coal Co. No. 9 Colliery, at Pittston.

Bituminous

Connellsville—The Byrne Coal & Coke Co. recently concluded negotiations for the purchase of the Whyel Coke Co.'s holdings in the Yukon field, aggregating about 100 acres. The purchase price was $70,000, to which $60,000 will be added by the Byrne concern in improvements. The construction of 60 new coke ovens, in addition to the 34 already in place, will be started soon.

Philadelphia—A committee of the Association of Bituminous Coal Operators of Central Pennsylvania is considering the question of bringing damage suits against the United Mine Workers of America as an organization and individually for alleged violations of a contract existing between the operators and the union miners of the central Pennsylvania soft-coal field. Such proceedings, if instituted, would be for the recovery of damages caused by petty strikes in violation of the contract.

Du Bois—It is alleged that the Northwestern Mining and Exchange Co. (an Erie Railroad affiliation) is so disgusted with the attempt of the union to enforce a closed shop that it is preparing to dismantle its Eriton mine near this place. Should this mine be allowed to flood it will be a serious menace to surrounding collieries.

WEST VIRGINIA

Charleston—The Main Island Creek Coal Co., which was recently reorganized at a meeting of the stockholders, will open up a new field in Logan County within the next few months. This firm expects to be shipping coal from six mines by Mar. 1, and from four others in 90 days later. Contracts have been let for the erection of 500 houses, two large storerooms and three power plants of 400 hp. each, which will be completed within the next 30 days.

Wheeling—After a thorough inspection of the mine assisted by J. W. Paull, a U. S. Bureau of Mines' man from Pittsburg, Earl Henry, on Jan. 14 decided that the recent explosion in the mine of the Mound Coal Co. at Moundsville, in which four men were injured, was the result of igniting an accumulation of gas caused by a fall which occurred after the mine fireboss had made his rounds. Aside from the injury to the four men, no damage was done to the mine, which is now in good condition.

Huntington—An important real estate deal was recently consummated at Ironton, Ohio, whereby the Hecla properties passed into the hands of F. B. Enslow, A. B. Brode and Julius L. Anderson, this property consisting of approximately 20,000 acres, a large percentage of which is underlaid with coal, will probably be developed at no remote date.

MARYLAND

Cumberland—The Consolidation Coal Co. has made an opening at mine No. 9, which will develop a new field estimated to contain about 600 acres of coal 3½ ft. thick. The company has completed the outside improvements at the mine and a new haulage system.

KENTUCKY

Whitesburg—It is reported, that since re-opening on Jan. 10, after an extended holiday lay-off, the several large plants of the Consolidation Coal Co. and the Mineral Fuel Co. in the Jenkins, Burdine, McRoberts and Fleming sections, are again operating on full time, in spite of the slow demand for coal in many markets. The shortage of fuel caused by the shutdown has resulted in a good demand from customers of the companies, and large steam contracts have to be filled, regardless of general conditions, which means that the companies will probably continue operations at an active rate, being to a large extent independent of the open market.

Madisonville—Reports indicate that considerable progress is being made by Eastern interests in securing control of undeveloped properties in this section, several deals having been closed recently. Garland Roney, of Providence, Ky., C. H. Murphey, of Madisonville, and others are reported to be interested, and to have made sales lately direct to the interests who are said to be acquiring the property. Nothing is heard, however, of the formerly rumored acquisition of a large number of opefating concerns by an Eastern syndicate.

OHIO

Martins Ferry—In line with the recommendations of the State Mining Commission's report to Governor Cox, the Providence Coal Co., with mines at St. Clairsville and Fairpoint, has appointed J. J. Forbes, a mining engineer, as safety inspector. Forbes' duties include the inspection of the mines to prevent possible accidents, the care of the mine-rescue apparatus, and the instruction of the men in accident prevention.

St. Clairsville—About 1000 miners employed in the Blaine and Lansing mines of the Lorain Coal & Dock Co. near St. Clairsville struck because the company refused to haul them into the mines on its mine cars. Under the provisions of the compensation law the company is responsible for injuries to miners while being hauled in that manner and since the men refused to waive their right of action the company refused to permit them to ride on the cars.

Lisbon—Dornacher & Rider, of Akron, Ohio, have purchased 3000 acres of coal lands in Wayne and Washington Townships in Columbiana County which they will develop in the near future.

Coshocton—The Morgan Run Coal & Mining Co., of Cleveland, has closed one of its mines in the Coshocton field permanently, throwing 25 men out of employment. The mine was closed following a visit of the State Mine Inspector D. H. Sullivan who ordered many repairs to insure safety to the miners. The company immediately closed the mine.

INDIANA

Boonville—The increase of stripping operations in the vicinity of Boonville, which have threatened to supplant shaft mining entirely, will meet with opposition in the future, the Central Labor Union of Boonville having adopted resolutions condemning the new method, for presentation to the United Mine Workers of America during the meeting which began Jan. 20. The resolutions point out that the stripping plan is not only detrimental to labor, but that land mined in this manner is completely devastated, and urgently recommend some action to check its further use.

Indianapolis—The Indiana Supreme Court, in a case in which the Shirley Hill Coal Co. was defendant, decides that where a healthy man of 35 years, earning $85 a month, was killed, leaving a wife and five children, a judgment of $8000 will not be held excessive without some showing of wherein the jury was prejudiced or acted with partiality or through corruption.

Dugger—The coal chute of the Sunflower Coal Co. near here was burned, with two cars of coal, Jan. 14. The loss was $6000.

ILLINOIS

Springfield—The Springfield coal Co. has closed three mines, one at Riverton, one at Klondike and one at Taylorville. The Taylorville mine has not been idle before since it was opened up, 25 years ago. The shutdown is indefinite, and all the miners removed their tools from all of the mines. In the aggregate, over 1000 miners are out of work from the three mines. No causes are given, excepting that there is no money in operating a coal mine. It is understood that three other mines of the Springfield Coal Co. will be shut down in the course of perhaps a week.

Pana—The Illinois Midland Coal Co. has filed a mortgage for $3,000,000 in favor of the Continental and Commercial Trust and Savings Bank of Chicago. Several thousand acres of coal rights were transferred this week by the Pawnee Construction Co. to the Illinois Midland Coal Company.

Bloomington—A fire of unknown origin recently destroyed the fan house and blacksmith shop at the McLean County Coal Co.'s mines. The monetary loss will aggregate over $1500, but added to this will be the inconvenience of a forced shutdown while repairs are being made.

West Frankfort—The South mine here recently hoisted 3886 tons of coal in one day. The Zeigler mine a few days earlier hoisted 3401 tons.

Pekin—Factories and railroads are commencing to store coal in anticipation of a strike which is expected when the new scale comes up for consideration and adoption.

OKLAHOMA

McCurtain—The mines of the San Bois Coal Co. will not resume operations until after the expiration of the present contract between the United Mine Workers of America and the Southwestern Interstate Coal Mine Operators' Association.

Poteau—The Claco Mining Co., recently incorporated with $50,000 capital, will shortly develop 260 acres of coal and clay properties, It has advertised for machinery to the value of about $15,000.

TEXAS

Brownwood—A thorough examination of the newly discovered coal field in the eastern part of Brown County has been made, and it is declared that a thick vein of lignite coal of a good quality exists there. The land on which this coal has been found lies along a ridge about 12 miles from Brownwood, and between the towns of Blanket and Zephyr. Leases have been secured on about 1000 acres of this land, and it is planed to start development as soon as possible.

KANSAS

Radley—Two shot firers were killed in Mine No. 48 of the Central Coal & Coke Co. near Radley, Kan., recently. A windy shot caused an explosion, resulting in the death of the men. The bodies were recovered about 12 hours after the exposion.

Mulberry—On Jan. 14 the cable at Mine No. 7 of the Spencer-Newlins Coal Co. broke, dropping the cage, which carried six men about 100 ft. to the bottom of the shaft. Three of the miners upon the cage at the time were killed, and the remainder seriously, if not fatally, injured.

COLORADO

Trinidad—It has been announced from the headquarters of the Colorado Fuel & Iron Co. that the coke ovens at Tercio and Tabasco resumed operations on Jan. 6. The resumption of operations at the coke ovens would signify that a full quota of men is employed at these places, and that the output will be materially increased.

Denver—Nine hundred union miners on Jan. 17 demanded the release within 24 hours of Mother Jones by the military authorities. This demand came from a meeting of strikers at Rockvale, about 900 men being in attendance. The miners affirmed that unless Mother Jones was freed within 24 hours, they would free her by force of arms.

FOREIGN NEWS

Vancouver, B. C.—Interest was recently aroused in Vancouver over the alleged discovery of large coal areas on Smoky River in Alberta, near the British Columbia border along the line of the Grand Trunk Pacific Ry. The coal is said to be a good grade of anthracite similar to that produced in Pennsylvania. The area of the property is 32,000 acres, and is leased at $1 per acre. The leasing company expects to sell the coal in the Prairie Provinces and on the Pacific coast.

PERSONALS

F. J. Harry, M. E. Markell, J. R. Davidson, Charles Detwiler and F. A. Parsons, of Uniontown, were recently elected directors of the Southern Connellsville Coke Co.

J. R. Watkins, Supt. of the Issaquah & Superior Coal Mining Co., after a hard year's work is taking a trip back to Wales. Mr. Watkins expected to sail from New York on the Lusitania on Jan. 14.

Malcolm Macfarlane was recently appointed inspector of mines for the New York Central & Hudson River R.R. Co., with headquarters at Phillisburg, Penn. H. B. Douglas, who formerly held this position, has been assigned to other duties.

R. B. Drum, general superintendent of the Vesta Coal Co., a subsidiary of the Jones & Laughlin Steel Co., with mines at California, Penn., retired Jan. 16 after more than a quarter of a century of service with the company. He was succeeded by H. B. N. Louttit, previously manager of the Monongahela River mine of the Pittsburgh Coal Co.

Charles F. Ice, formerly manager of the Millers' Creek division of the Consolidated Coal Co. in Kentucky, was recently made chief coal inspector for the same firm with duties embracing all divisions. G. M. Gillette, formerly assistant general superintendent of the Elkhorn division, was promoted to be manager of the Millers' Creek division succeeding Mr. Ice.

OBITUARY

L. E. Monser, president of the Wenona Coal Co., and a pioneer operator in the Illinois coal fields, died at his home at Wenona, Ill., recently, after a long illness.

The body of Edward Joyce, who mysteriously disappeared from his home in Carnegie, Penn., in April, 1909, was discovered in some abandoned workings of the Camp Hill mine of the Carnegie Coal Co., on Jan. 14. The portion of the workings where the body was found had been bratticed off from the rest of the mine for several years on account of firedamp. How Joyce, who was boss of the pit at the time of his death came to enter these abandoned workings is unknown, but it is now believed that for some reason he did so and was overcome by the firedamp.

CONSTRUCTION NEWS

Scranton, Penn.—The Pennsylvania Coal Co. is rapidly pushing the erection of its new breaker at Underwood.

Myersdale, Penn.—Men and teams are at work transporting machinery and putting it in place for starting a new coal mine a short distance below the sanitorium power house near this place.

Chillicothe, Ohio—The Norfolk & Western R.R. intends to build a short line about 17 miles in length to penetrate the coal fields of Pike Co., Ky. This branch has been incorporated at Frankfort, Ky., as the Tug River & Kentucky R.R. Co.

Cumbo, W. Va.—In addition to other improvements recently made at the Cumbo yards of the Baltimore & Ohio work has recently been started upon a coal tipple. This structure will be of concrete and its erection is being somewhat impeded at the present time by cold weather.

Pittsburgh, Penn.—The William B. Scaife & Sons Co., of Pittsburgh, Penn., recently received a contract from the Pittsburgh Coal Co. for three steel tipples, each requiring a large amount of structural steel. These tipples are for the Montour mines Nos. 1, 2 and 4.

Lancaster, Penn.—The Philadelphia & Reading R.R. Co. recently awarded to Witmer & Warsel the contract for the erection of concrete and steel coal pockets, office and stable at Lancaster. The work is to be started in the near future and rushed to completion.

Galveston, Tex.—The Atlantic States Coal & Coke Co., a subsidiary of the Clinchfield Fuel Co., has selected Galveston as its headquarters. It is the ultimate intention of the company to locate large storage yards, loading apparatus and a coke-manufacturing plant at Port Bolivar, on Galveston Bay directly across the harbor channel from the Galveston dock.

Bluefield, W. Va.—Large forces of men are engaged along the line of the Norfolk & Western R.R., between Bluefield and Vivian, and work is being pushed rapidly upon the electrification of this section. At the present time construction work is being concentrated to a large extent on the Elkhorn and Maybeury grades. It is now estimated that one year will be required to complete the electrification of the division.

Uniontown, Penn.—Reagan, Lynch & Co., contractors, of Uniontown, have recently completed arrangements for the installation of five Covington coke-drawing machines for the H. C. Frick Coke Co. Three of these machines were erected at the Mammouth works and two at Calumet. The installation of these coke drawers required a large amount of grading, laying of tracks and the reconstruction of the fronts of many ovens. The work was started last September.

Martinsburg, W. Va.—Announcement was recently made that all the rights of way for the new railroad in the Back Creek Valley have been secured and that work will be begun early in the spring. It is not definitely known what route will be followed, two having been surveyed and both being declared to be excellent. The New York syndicate owning the territory has acquired about 30,000 acres of coal land. An analysis of the fuel shows it to be of the best quality.

NEW INCORPORATIONS

Maryland, Tenn.—The Maryland Coal & Coke Co. has been incorporated with a capital stock of $50,000.

Pekin, Ill.—The Champion Coal Co. has been organized with a capital stock of $20,000, to mine and deal in coal. The incorporators are A. L., C. L. and A. P. Champion.

Connellsville, Mo.—The Connellsville Coal & Mining Co. has been incorporated with a capital stock of $15,000. The incorporators are C. W. Evans, Marion C. Miller and S. F. Shoop.

Murray City, Ohio—The Globe Coal Co. has been organized for the purpose of mining and dealing in coal. The capitalization is $10,000, and the incorporators are Vance Webb, Louis Green, E. W. Davis, L. P. Mooney and Arthur Green.

Wellston, Ohio—The Blue Jay Coal Co. has been organized for the purpose of mining and marketing coal. The capital is $10,000, and the incorporators are W. F. McCloud, H. A. Goddars, Grant McGhee, John K. Yeager and G. E. Littler.

Lewiston, W. Va.—The Lewiston Block Coal Co. has been incorporated with a capital stock of $25,000, for the mining of coal. The incorporators are A. A. Starbeury, W. E. Chandler, L. J. Schwartz, Homer Wiseman, and C. W. Morton, all of Charleston, W. Va.

Charleston, W. Va.—The Mill Creek Cannel Mining Co. has been organized to mine coal with a capital stock of $10,000. The incorporators are W. M. Watles, F. G. Campbell and C. Riggs, of Charleston, W. Va., and J. F. Hindson and Fred Watles, of Villa, W. Va.

Carlinville, Ill.—The Elly Coal Co. has filed papers of incorporation. The capital stock is $2,800,000, and the incorporators are Henry C. Hamilton, C. C. Terry, of Girard, and Albert Salzenstein, of Springfield. The company has several thousand acres of coal land in east Macoupin and west Montgomery Counties.

INDUSTRIAL NEWS

Sullivan, Ind.—The mines of the Carlisle Coal & Clay Co. have been sold to the Chicago-Carlisle Coal Co. and will be reopened.

Memphis, Tenn.—The Memphis Coal Briquette Co. is arranging to build a plant with a daily capacity of 200 tons for the manufacture of briquettes. These will be made of West Kentucky slack with a binder of asphaltic material.

Winchester, Ky.—The H. S. Davis Co. on Jan. 15 sold to the Woolf Valley Coal Co. 1270 acres of coal land in Breathitt County near the Perry County line at a private price. Immediate possession will be given and development on a large scale will soon start.

Chicago, Ill.—The O'Gara Coal Co. has given notice that all interest coupons on the bonds of the company due Sept. 1, 1913, will be paid at the office of the company in the Marquette Building, Chicago, on presentation. A few such coupons are still outstanding.

Indianapolis, Ind.—The National Executive Board of the United Mine Workers of America convened here Jan. 16 at the international headquarters to take up the consideration of appeals from the various districts. The business of the board is said to be merely routine.

Henderson, Ky.—The highest price for coal rights said to have been paid in Henderson County up to the present time was $46 per acre recently paid by the People's Mining Co. to W. T. Lambert. J. W. Todd sold about 45 acres of coal rights to the same company for $25 per acre.

Charleroi, Penn.—The H. C. Frick Coke Co. has bought two tracts of coal in Fallowfield Township from W. J. Emery and wife, of Washington. One contained 105½ acres approximately, and the other about 29¾ acres. The price paid was $75,000. This coal adjoins a large tract now held by the Frick Co.

Terre Haute, Ind.—The Illinois Midland Coal Co. has transferred to the Midland Counties Coal Co. 56,500 acres of land and mineral rights, valued at $6,000,000. At the same time record was filed of a sinking-fund mortgage of $3,000,000 upon this property. The land lies in Sangamon and Christian Counties in Illinois and in Otter Creek Township of Vigo County, Indiana.

Springfield, Ill.—The report of Master in Channcery, J. M. Pfeifer on the foreclosure sale of the properties of the Illinois Collieries Co. showed a deficit of $2,983,012.50. The properties were sold Nov. 15 to the Pittsburgh Coal Co. for $126,000. The deficit represents the amount of outstanding bonds, together with interest, and renders certain a total loss of investment to the bondholders.

Drifton, Penn.—Umpire of the Conciliation Board Charles P. Neill recently decided that the action of the Lehigh Valley Coal Co. in cutting the yard price for laying roads from 61 cents to 24 cents in August 1912, and also similarly for moving gob per car, was contrary to the wage agreement. By this decision several thousand dollars back pay will be turned over to contract miners.

Washington, D. C.—According to the testimony before the House Committee on naval affairs of Rear-Admiral R. S. Griffin, the coal taken from the Bering River field in Alaska and tried experimentally by the American navy to determine its fitness for naval uses was a complete failure. Chemically this fuel appeared to be better than the famous Pocahontas coal, but when tested it failed utterly to give the anticipated results. This was extremely disappointing to the officers of the navy.

Mobile, Ala.—The Alabama Fuel & Iron Co., of Birmingham, with mines at Acmar and Margaret on the Central of Georgia, and at Acton on the Louisville & Nashville has opened a Mobile office and appointed Messrs. W. M. and J. F. Johnston, of Mobile as its agents with the idea of entering into the bunkerage business. Contracts have already been signed with the Seeberk Steamship Line, Orr & Laubenheimer Co., fruit importers, and Hubbard-Zemurray Steamship Co., amounting to over 50,000 tons. The coal to be supplied is the Acton, Acmar and Margaret washed nut and slack, all of which is especially suitable for steamship use.

Coal Trade Reviews

General Review

Anthracite much improved by the more seasonable weather, but still lacking the customary snap. Curtailment in mining and further recessions in the bituminous situation. Sharp competition for any spot business that developes. Considerable demurrage coal appearing.

There has been a generally consistent improvement in anthracite all along the line since the recent severe cold snaps. Increased activity is noted in both retail and wholesale business but more particularly in the former. Operations in the mining regions continue on full time, and the fact that the output is being absorbed and some additional picked up from storage piles is indicative of a substantial movement. But all sizes are in free supply, and the customary snap of a mid-winter market is entirely absent.

Curtailment in mining is the salient feature in the bituminous situation. As in anthracite the more seasonable weather has tended to divert attention from the weak spots in the trade; but this has not been sufficiently persistent to hold the market steady, and further recessions are still noted, some spot business being negotiated at lower figures than prevailed at any time in 1913. Demurrage has become a prominent feature in the market, the selling price of occasional tonnages of off quality soft coal often being fixed by the amount of car service against them. Inquiries at the moment are only scattering, and the future market will be greatly influenced by the coming wage conference.

Operations in the Pittsburgh district are still heavily curtailed in spite of an increased domestic demand as a result of the lower temperatures. There is sharp competition for what little spot business developes, and the circular is freely cut. In spite of the determined effort to maintain prices in Ohio the customary winter schedule has finally been reduced to about the usual summer level; business in the spot market is confined entirely to small domestic orders which have developed as a result of the recent change in weather conditions. Contracts for the new year are being negotiated on the same basis as last year with provisions for any change in the mining scale, and method of paying the miners. The circular at Hampton Roads is being well maintained, but the movement is light. The steam demand in the Southern market is somewhat improved, while the colder weather has resulted in an increased movement of the domestic grades, and a general improvement all along the line.

Although the Middlewestern trade is well supplied with coal, the lower temperature has created such an active situation in retail circles that the affects are being felt at the mines. The domestics are notably stronger, while the steam fuels are also showing some improvement. Anticipation of possible labor troubles is already creating a rather tense feeling in some quarters, and a few large steam users have adopted a regular buying program that will provide for an accumulation of surplus stock.

EASTERN MARKET

BOSTON, MASS.

"Opening prices" rumored on Pocahontas and New River as $2.85 plus the possible advance in tolls; but little interest among buyers. Low prices on "market coal" for inland distribution. Anthracite a weather market, with stove the only short size. Disastrous gale on the coast.

Bituminous—Seasonable weather has drawn attention away from the weak spots at Hampton Roads for the time being, and there is beginning to be talk of "opening prices" on Pocahontas and New River. The consensus of opinion seems to be that the f.o.b. basis will be the same as last year, $2.85, unless the much discussed advance in tolls is made, and in that case the advance will be added. There are already rumors of certain pro forma contracts being closed on such an understanding, but it will probably be several weeks at least before there is any significant movement. A good deal will depend on the labor negotiations in the Pennsylvania districts, and it is now rather early to make forecasts.

The question of tolls is a subject of great interest to the New England trade. If coal rates are advanced all over on a percentage basis it is readily seen that it will operate rather against the all-rail shippers into New England and in favor of those who handle Southern coals at tide-water. The general impression is that such a horizontal ruling will probably be the outcome of the present hearings before the Interstate Commerce Commission.

At Providence and Boston cargoes shipped on the market have lately sold down to figures lower than at almost any time in 1913. The demand for coal inland is practically nil.

In Georges Creek and the Pennsylvania grades there is practically no market news. Operations in all the districts are under more or less curtailment and there is only a scattering inquiry. On the quality coals prices are held on a firm basis but that is a matter of policy and not in any way an indication of a better market. The lower priced varieties are heavy and the selling price depends largely on the amount of demurrage that may have accrued and how large a loss the individual shipper cares to sand. All-rail trade is more than listless.

Anthracite—We have now had nearly two weeks of strong coal burning weather and orders are beginning to filter in. Stocks are generally so large however that low temperatures will have to continue for a longer period to develop any considerable demand on the shippers. The companies are still limiting the proportion of stove size in any one cargo but every other size is in easy supply. Dock screenings are scarce on account of the light shipments of domestic coals over the piers.

The Arctic gale early last week worked havoc to shipping along the coast. The property loss is estimated at nearly $1,000,000, six schooners and a barge having been lost.

Current wholesale quotations are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.00@1.50	$1.25@1.60	$1.67@1.77	
Philadelphia*	2.25@2.75	2.50@2.85	2.92@3.02	
New York*	2.55@3.05	2.80@3.15	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				$2.80@2.90
Boston†				3.53@3.72
Providence†				3.58@3.72

*F.o.b. †On cars.

NEW YORK

Market continues dull, even the better grades showing the effects of the heavy pressure. Outlook in bituminous indeterminate. Anthracite more active as a result of the colder weather. Mines still working full time.

Bituminous—The soft-coal market has suffered a still further decline during the week, and the pressure is even being felt on the better grades. The good qualities have been in uniformly good demand in the past but occasional reports of weakness are now heard. Considerable coal is on demurrage, and, as usual, the market must be forced in order to find a disposal. As a rule, this is being confined mostly to the off qualities, but, as noted, occasional tonnages of the better grades are heard. It is particularly notable that the market at tidewater continues to lead in the decline; all-rail business is holding up in fair shape, particularly up in the New England district.

But, in spite of the generally depressed conditions, the larger companies maintain an optimistic attitude toward the future market. This may possibly be due to the fact that they are the least sufferers from prevailing conditions as their tonnage is well covered, while many of the smaller concerns are being forced to restrict operations. The outlook is rather indeterminate and dependent on future developments in other lines. Already, a more cheerful feeling is noted in the Western trade as a result of the increased operations in steel.

We quote the New York market weaker but with the price base unchanged as follows: West Virginia steam, $2.60@2.75 good grades of Pennsylvania, $2.75@2.85; best Miller Pennsylvania, $3.10@3.20; George's Creek, $3.15@3.25.

Anthracite—The colder weather of a week ago has had a notably stimulating effect on hard coal. In addition to this, production was more generally curtailed over the holiday period than was anticipated, and there has been a mild rush for certain grades in short supply. All the high-grade buck-

wheats are in good demand as are also pea and egg coal in the domestic sizes. The other prepared grades are inclined to be heavy, particularly stove coal, which is notably long; No. 2 buckwheat in the low grades is rather short, while No. 3 is normal and No. 1 long.

Generally speaking, the domestic grades are all easier, while the steam sizes are strong. The movement out of storage, while improving during the past two weeks, has nevertheless been below normal for the season. All companies report stocks on hand to be larger than normally the case at this season. Some even fear that certain grades will be carried over after the Apr. 1 discount goes into effect.

We quote the New York market on anthracite as follows:

	Upper Ports		Lower Ports	
	Circular	Individual	Circular	Individual
Broken	$5.00	$5.10	$5.05	$5.05
Egg	5.25	5.35	5.30	5.30
Stove	5.25	5.25@5.35	5.30	5.20@5.30
Chestnut	5.50	5.60	5.55	5.45@5.05
Pea	3.50	3.55@3.60	3.50	3.50@3.55
Buckwheat	2.75	2.75	2.70@3.45	2.25@2.70
Rice	2.25	2.25@2.35	1.95@2.20	1.75@2.20
Barley	1.75	1.75@1.80	1.70	1.50@1.70

PHILADELPHIA

Mining continues full but there is a lack of snap. All grades easy and trade needs a sharp rush of orders to clear up stocks. Prompt shipments made to New England.

Trade conditions in this vicinity are at least on a parity with last week. The wholesalers have not found it necessary to curtail mining, which is an indication of improvement, as the market must be absorbing the entire output; but the lack of snap that should characterize the market at this season is still apparent. All the dealers state that the call is not as active as last week, but that considerable coal is moving. As a matter of fact, all sizes seem to be in fairly easy supply. Broken, egg, stove and chestnut, and the smaller sizes are all on a parity, as far as demand is concerned.

The fact that all sizes are moving off would indicate a fairly healthy condition, but what the operators want is a rush that will deplete the stocks, which are reported to be fairly heavy. In spite of the fact that there has been fairly seasonable weather, it will take more than one or two weeks of this to help much. All through the winter there has been no disposition on the part of the trade to place orders ahead for coal. This is doubtless due to the fact that no difficulty has been experienced in securing almost any size required. If the operating companies cannot supply it, the individuals can, and quite frequently at lower prices, either by an absorption of the state tax, or a straight cut from the circular. It is understood that even stove coal, which has held its own pretty well throughout the winter, is being sold at reduction of 25 to 30c. by some of the individuals.

Retail prices continue as follows: Egg, $7; stove, $7.25; chestnut, $7.50; pea, $5.50. Prices at wholesale tidewater still continue as follows: Broken, $4.50@4.75; egg, $4.75@5; stove, $4.75@5; chestnut, $5@5.25. The differentials mark possible concessions on the part of individuals.

It is understood that the anthracite companies shipping coal from tidewater to the New England market are still able to furnish loading for the large fleet of barges engaged in handling this business, but there is no marked activity. It is almost a case of shipping the order as fast as entered, in marked contrast to normal years, when three weeks was considered ample time in which to even expect that an order would be forwarded.

The bituminous situation is characterized as poor, by some operators, but others seem to discern an improvement, as manifested by a better demand, although prices are unchanged. Taking this trade as a whole, however, there is still large room for improvement.

BALTIMORE, MD.

A feeling of confidence in the future of the coal trade. A little more inquiry developing for soft coals, and the anthracite demand is about up to seasonable average now. A number of charters announced.

In spite of all the flat conditions in the present market there is a growing feeling of confidence in the near future of the coal business. Mine interests are going ahead with development plans on the belief that things will soon take a turn for the better in the general industrial situation. The head of one of the largest coal concerns here expressed himself as entirely satisfied that the next two months would see a change for the better.

Prices at present remain at a standstill. West Virginia gas coals run from about 80 to 90c. at the mines, with steam fuels at from 90c. to $1. Pennsylvania fuels of ordinary grade command from 95c. to $1.10, with best grades worth about $1.30.

Hard coal call here is pretty well up to the seasonal average, that is for immediate sales, although the warm winter has made the business as a whole unsatisfactory. Encouragement is found in the announcement of a number of vessel charters for loadings at local piers. Especial activity was shown in foreign charters.

CENTRAL STATES

PITTSBURGH, PENN.

Demand light and production continues at about 50% of capacity. Prices are being freely cut on prompt lots. Connellsville coke demand light, with prices unchanged.

Bituminous—Demand for domestic coal has been somewhat better, as the weather has been seasonably cold, but there has been no increase in demand for railroad or manufacturing purposes, and production continues to average about 50% of capacity in the Pittsburgh district. Outside of the requirements of retail dealers there is hardly any call for prompt coal, shipments being almost exclusively against contracts, and at much less than the normal tonnages involved in such contracts. A few operators are competing rather sharply for the limited orders offered, and regular circular prices are being freely cut in most cases, sometimes to the extent of 10c. or 20c. a ton, except in the case of slack, which is bringing 15c. to 25c. above the circular price. We repeat circular prices as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in. steam, $1.50; 1¼-in. domestic, $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The market has been quiet, no contracts having been made in the past week, while demand for prompt coke has been quite limited. There are two inquiries in the market respecting contracts, one for delivery beginning February and the other for delivery beginning March, but these are not taken seriously since the buyers had bought for the short period and are rather expected to continue buying from month to month rather than make contracts. Prices are about as well held as formerly, and we quote: Prompt furnace, $1.90; contract furnace, $1.90@2; prompt foundry, $2.40@2.65; contract foundry, $2.40@2.65, per ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ending Jan. 10 at 260,670 tons, an increase of 8519 tons, and shipment at 258,459 tons, an increase of 6308 tons.

BUFFALO, N. Y.

Coal too plentiful for much firmness. More interest now in labor matters than in trade. All reports indicate that a sharp clash is certain. Loading water coal suspended.

Bituminous—The sharp spurts of cold meather are more numerous than formerly, but are of too short duration to give tone to the coal trade, although some dealers find business steadily improving. As a rule, the improvement in demand is slowly increasing, but prices do not advance. There is not now much coal on track here unsold. Dealers have united to some extent and cleaned it up, with the understanding that it should be kept so; as long as there is a car unsold the buyer is in control of the price. There are many reports of shutdowns on account of inability to sell the full output.

The miners are becoming more difficult to manage, and strikes are numerous. Even where mine superintendents strictly observe union rules there are strikes on all sorts of minor differences. The statement made by one of the leading miners' officials that the operators will readily yield to a demand for higher wages, even before the mining year is up, is repudiated by the producers who say they have a surplus of coal, both here and on the upper lakes and do not care if they are idle till June. If the winter is not very severe from now on a long suspension will be welcome.

Some fair prices are still to be obtained for bituminous, in spite of the reports of much cheap coal offering. The highest prices are based on $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack. The market for slack is growing steadily firmer. Allegheny Valley coal is about 25c. lower than Pittsburgh.

Coke—There is a little better feeling in the coke market, but it will take some time for prices to advance or even stiffen up to any great extent. The activity of the steel mills is not yet sufficient to create the proper demand for coke. The feeling in iron is better, however, and an improvement is looked for before long. Best Connellsville foundry is quotable at $4.50.

Anthracite—The demand is still light, both locally and for rail-line shipment. The mines are running at a slow rate.

There was at one time a large amount on cars here, but that has been cleaned up. About 50,000 tons was loaded into vessels, and it is now stated that no more will be brought here for water shipment. It is customary to begin loading at least as soon as March if the coal is to be had. Reports from the upper lakes indicate that there will be quite a large surplus on the docks there on May 1, unless the winter is severe. The handlers of independent anthracite are doing very little business.

TORONTO, CANADA

Cold wave has stimulated the market. Steam demand fair but not up to normal.

Coal dealers have been busy as a result of the extremely cold weather. The cold wave was attended by a rush of orders calling for immediate delivery and dealers in many cases were obliged to take on extra help in order to fill them. The demand for soft coal for factory purposes is fair, but not equal to that of last season as manufacturing is quiet. The yards are well supplied, but freight traffic has been congested by the cold snap causing some delay in deliveries. Quotations remain unchanged.

COLUMBUS, OHIO

A new lower circular stimulated buying in steam and domestic sizes. Weather conditions improved and there is a generally better tone to the trade. Wage scale and legislation the main features of interest.

After determined effort to uphold prices for the past two months against adverse conditions, operators and jobbers last week announced a reduction in the circular, placing quotations at the lowest level for several months. This was done in order to steady prices, as cutting was prevelent in all fields. The new level, which is about the same as usually prevail in the summer months, is expected to have a good influence upon trade.

Domestic demand took a brace recently because of the short spell of wintry weather. Dealers put in small orders to replace stocks which were sold at that time. But generally speaking supplies in the hands of retailers are large. It will require considerable cold weather to have any great effect on the trade. Retailers have had a good run of small orders and their teams have been busy.

The steam business showed a little spurt also but is still at a low ebb. A number of manufacturing plants which suspended during the holidays have resumed operations and this means an increased demand for certain grades. Railroads are also taking a large tonnage. As yet manufacturers are doing little toward stocking up to guard against a suspension after Apr. 1. Certain railroads have started their stocking movement. Contracts for steam tonnage are being made at the same figures as last year with provisions for changes in the mining scales and the method of paying miners.

The output during the week averaged about 50 per cent. of normal, due to the slack demand. In the Hocking Valley district the production was about 50 per cent. of the average and the same is true of Pomeroy Bend district. In eastern Ohio and the strictly domestic fields the production was about 40 per cent.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50 @ 1.45	.....	$1.50 @ 1.45	$1.50 @ 1.40
3-4 inch	1.35 @ 1.30	$1.20 @ 1.15	1.35 @ 1.30	1.35 @ 1.25
Nut	1.25 @ 1.20	.....	1.30 @ 1.25	1.25 @ 1.20
Mine-run	1.15 @ 1.10	1.10 @ 1.05	1.15 @ 1.10	1.15 @ 1.10
Nut, pea and slack	0.80 @ 0.75	.....	0.85 @ 0.80	0.80 @ 0.75
Coarse slack	0.70 @ 0.65	1.00 @ 0.95	0.75 @ 0.70	0.70 @ 0.65

DETROIT, MICH.

Considerable coal on demurrage. Market somewhat improved by changed weather conditions but business still slow. Some stocking against a possible suspension in April.

Bituminous—The colder weather over the past week has helped the situation somewhat, but it will have to be of considerable duration before any material benefit will be derived. Prices remain at about the same level, but the movement was somewhat improved, and a generally better tone noticeable. There is said to be approximately 700 cars of consignment coal on track at Detroit, the majority of which is under demurrage anywhere from $1 to $15 per car. Conservatism in mining seems to be the rule, and this will no doubt continue until the surpluses are reduced.

There is an increased demand for the steam grades, also Pocahontas and splint coal. The railroads seem to be in the market for more coal and greater activity is noticeable in general manufacturing. Some stocking against a possible suspension Apr. 1 is also being done.

Mine-run, which ordinarily sells at $1.10@1.20 f.o.b. mines is now readily obtainable at $1; slack is the strong feature at the moment being quoted as high as $1 per ton on occasions.

The market is now quotable on the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.65	....	$1.50	....	....	$2.50	$2.50
Egg	1.65	....	1.50	....	....	2.50	2.50
Nut	1.25	....	1.30	....	....	....	....
Steam lump	.25	....	....	....	....	....	....
¾-in. lump	1.10	$1.10	....	$1.00	$1.00	....	....
Mine-run	1.00	1.00	....	1.00	1.00	....	1.25
Slack	1.00	1.05	.80	0.85	0.85	....	....

Anthracite—Indications point to a favorable business this month particularly on domestic sizes.

Coke—Connellsville coke is fairly steady on both contract and spot business. There is little inquiry and scarcely any new business being closed. Local jobbers have accepted as low as $1.90 for contract coke, but the market is more nearly quotable on the basis of $2.

HAMPTON ROADS, VA.

Loadings of coal from Hampton Roads somewhat light both on cargo and bunker vessels. Little demand during week for spot coal. Domestic business improved by colder weather.

Shipments from Hampton Roads during the past week have been somewhat light. This applies to bunker as well as cargo vessels. The greater portion of the coal moving during the week has been on contract business although, of course, there have been some small spot sales. Even with the light demand suppliers are not cutting prices below the circular which has been in effect for some time.

Several cold days during the week has caused a better demand for domestic coals and retailers have had perhaps one of the best week's sales of the winter although they still complain of poor business.

Foreign shipments from Hampton Roads for the week have gone to Montevideo, Kingston, St. Thomas, Port Antonio, Canal Zone, St. Lucia, Para and Manos. Shipments coastwise went to Boston, New Bedford, Providence, Portland, Fall River, Allens Point, and Jacksonville.

The schooner "Grace A. Martin," which sailed from Norfolk, Jan. 4, with a cargo of over 5000 tons of coal for Portland is reported to have foundered Jan. 14 near Martinous Rock. Two of the Palmer schooners which loaded here recently are past due at their destinations and considerable anxiety is felt as to their safety.

LOUISVILLE, KY.

Adverse conditions further intensified by continued mild weather. Heavy stocks on hand. Operations much restricted and prices soft.

Market conditions are practically unchanged although perhaps further intensified by another week of mild weather. Domestic coal is almost unsalable, and the steam market is rapidly reaching the same state. There was promise of some cold weather but the flurry did not last, and was succeeded by the mildest temperatures experienced within the past month or so. In consequence, the demand has since been negligible.

The efforts of the operators to effect sales have been almost wholly without results as the retailers are heavily stocked with coal purchased at bargain prices during the past month; and as the season advances with little demand from domestic consumers, the retailers are naturally disinclined to take on any further supplies. Half-time operations, or less, are in effect at many of the mines, but notwithstanding this, the supply of screenings is inexplicably large.

Prices on all grades have been affected by the conditions indicated, although it is generally recognized that it is futile to make radical cuts. However, orders are eagerly sought, and the few purchasers who are in the market have the trade at their mercy. The better grades of eastern Kentucky block can be had at $1.65 or thereabouts, which sufficiently indicates the state of the market. Nut and slack has held up much better, in comparison with this figure, but is difficult to dispose of, and 65 to 75 cents may fairly be said to represent the range of the market on first-class coal, while the lower grades are freely offered at much less.

KNOXVILLE, TENN.

Colder weather this week has caused a recovery in the market. Notable lack of consignment coal.

The market in this field was completely demoralized by the warm weather which prevailed from Nov. 10 until Christmas day. The New Year opened with coal selling at almost any price that could be secured on domestic, while steam quotations have been sagging since Jan. 1.

During January mines have averaged about four days per week, some less. Operators, however, seem to have gotten over the unprofitable habit of loading and shipping coal for which they had no orders, and little fuel has been reported on consignment this season. This fact has saved the market from a worse condition than prevailed. The cold weather of January has reduced stocks materially, but at present is having strengthening effect on prices.

SOUTHERN AND MIDDLE-WESTERN

BIRMINGHAM, ALA.

Market on domestic coal slightly improved and steam grades also in better demand. No change in blacksmith coal and furnace and foundry coke still quiet. Pig iron shows heavy sales but at slightly lower prices. Car situation fairly satisfactory.

Cool weather for several days has caused a slightly larger demand for domestic lump, though shipments are not what they should be for this time of the year. Steam coal has improved, the demand being much larger from the small users, and shipments on regular contracts increased. The outlook is better on both grades than last week. There is no change in the blacksmith market, prices and demand being about normal.

Furnace and foundry coke show little, if any, improvement, and the prospects are not as encouraging as on coal. Heavy sales of pig iron, amounting to about 125,000 tons, were booked during the week for delivery during the first half of 1914, but the prices were slightly below the $11 per ton basis 2 Foundry f.o.b. Birmingham. The car situation has improved materially, and little trouble is being felt from this source.

NEW ORLEANS

Demand increases due to high price of oil. Better coaling facilities in harbor will cause more steamships to coal at this port. Prospects for year are excellent.

Increasing prices for fuel oil is causing many steam plants in this territory to return to coal. The change of the Kansas City Southern R.R. from oil to coal is certain to have much influence on smaller consumers still using oil. It is stated that a few cents more added to the present price of fuel oil will cause the Southern Pacific to take the same step. This tendency is broadening the market for coal.

Prospects for the year's business are better than has been the case for a decade. The decrease in the use of fuel oil will be the cause of the greatest increase in coal consumption, but the improvement of the coaling facilities in the harbor will mean that many of the lines, not coaling here at present, will do so later. The facilities for loading of coal cargoes here are also likely to be improved, according to the plans of the dock board.

Despite the heavy stocks, orders awaiting the rise in the Ohio are large, while there has been no reduction in the standing orders at the mines in Alabama. With southern Louisiana and Mississippi experiencing the mildest winter in years, the demand for fuel is far below normal.

CHICAGO

Cold weather has a beneficial effect upon market conditions although they are not yet satisfactory. The domestic trade is somewhat stronger and dealers in steam coal are more hopeful. A large amount of steam fuel is being stored in anticipation of a suspension.

Lower temperatures have resulted in an appreciable upturn in general conditions in the Chicago coal market although the situation cannot be characterized as satisfactory. The tone of the domestic trade is stronger with prices remaining firm.

Dealers in steam coal are more optimistic as a result of a slow but steady improvement in manufacturing. Employees of mills and factories laid off before the holiday season are returning to work in large numbers and the consumption of steam fuel has correspondingly increased. Another important factor in the situation is the fear of labor difficulties. This has caused many of the larger consumers of steam coal to adopt a fixed plan of purchasing for storage purposes and the trade has been quick to feel the effect. Market observers express the opinion that there will be serious difficulties and that the present is an opportune time to provide safeguards against a future shortage.

Retail dealers report increased sales of anthracite coal. All-rail shipments are being absorbed more readily although there has been little influence brought to bear on movements from the lake docks. The operators in Franklin County announce that the colder weather has had no appreciable effect upon prices except to check a downward tendency. The better grades of this fuel are commanding $1.75 while other coals sell at prices ranging between $1.50 and $1.65. Prices for Carterville coal remain at about the same level.

There has been some increase in the demand for smokeless coal. A surplus accumulated several days ago because of a curtailment in production and this has been disposed of at prices quoted a week ago. The Hocking market is firmer and dealers believe it will continue to gain strength. The new circular price of $1.75 for 1¼-in. lump, the mines, holds firm. The situation so far as splint coal is concerned shows little change. A large amount of Indiana coal is being stored by steam users and the effect on the market is noticeable in a firmer tone generally.

Prevailing prices at Chicago are:

	Springfield	Franklin Co.	Clinton	W.Va.
Domestic lump	$2.32	$2.55@2.80	$2.27	
Steam lump	1.97		1.97	
Egg		2.55@2.80		$4.30
Mine-run	1.87	2.30	1.87	3.45
Screenings	1.47	1.75@1.85	1.47@1.57	

Harrisburg coal is: Domestic lump and egg, $2.25@2.85; steam lump, $2.25; mine-run, $2.25; screenings, $1.75@1.85; No. 1 nut, $2.55@2.85; No. 2 nut, $2.55.

Carterville quotations are: Lump, egg and No. 1 washed, $2.55@2.85; No. 2 washed, $2.55.

Coke—Connellsville, $5.25@5.50; Wise County, $5@5.25; by-product, egg, stove and nut, $4.90@5; gas house, $4.65@4.75.

INDIANAPOLIS

A touch of cold weather created activity in the retail trade. But it was short-lived and market is back in the rut. Some storing against a shut-down in case operators and miners fail to agree on next wage scale. No transportation troubles. Prices generally fair.

With the temperature around 15° above for a few days the domestic coal trade was benefited, at the yards, but the effect was not felt at the mines. Retailers are well supplied, generally. They seem to have contracted for normal amounts last summer and fall and the winter so far has been mild. They have had no chance therefore to get low in their supplies, for there was always plenty of contract coal ready to fill any holes. The change of weather again dashed the hopes of dealers who anticipated a stretch of real winter.

Mine operations show little change. What little activity there is, comes from large consumers who do not care to risk a shut-down of the mines on Apr. 1 and in consequence are increasing their stores of coal. There is little if any complaint of handling of the coal by the railroads. Conditions have improved greatly in this respect over those prevailing in October and November.

Prevailing prices at the mines are $1.10 for No. 4 mine run, $1.25 for steam lump and nut; $1.45 for egg; $1.70 for domestic lump and 80c. for screenings. Contract business is slightly higher and coal in the open market can be had slightly lower than these figures. Screenings continue scarce and prices stiff while some bargains are reported in mine-run and domestic lump. There is no demoralization, however, and prices are well maintained, taking the Indiana field as a whole.

ST. LOUIS, MO.

Demand for domestic grades poor, due to mild weather. Situation now hinges on the coming labor conference.

Continued warm weather has broken down the market, and there is absolutely no demand at all for domestic sizes and the steam sizes weakening. There is something radically wrong with local conditions, but the trade seem unable to solve the problem; with no demand for lump and egg there seems to be a tonnage of the small sizes, sufficiently large to take care of the demand, and for the past week the screenings market has been gradually dropping.

It is the same thing with everything else; anthracite, coke and smokeless are slower now than in the month of March, which is usually the dullest in the year. There seems to be no relief in sight, unless it is cold weather, and the trade has about given up hope of seeing any real winter.

If the conferences between the miners and operators bring about any indication of a suspension or a strike in April, it will materially improve conditions, but if a settlement seems probable the situation will likely become worse.

The prevailing market is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.90@1.00
3-in. lump	.....	.....	$1.40	.....
6-in. lump	$1.25 @ 1.50	$2.25	1.50	1.15@1.25
Lump and egg	1.85 @ 2.15	.....	.....	.....
No. 1 nut	1.15 @ 1.40	.....	.....	.....
Screenings	0.75 @ 0.80	.....	.....	.....
Mine-run	1.10 @ 1.20	.....	.....	.....
No. 1 washed nut	1.60 @ 1.75	2.25	1.60	.....
No. 2 washed nut	1.25 @ 1.35	.....	1.25	.....
No. 3 washed nut	1.15	.....	.....	.....
No. 4 washed nut	1.05	.....	.....	.....
No. 5 washed nut	0.50	.....	.....	.....

KANSAS CITY, MO.

Demand light due to unseasonable weather. Mining much curtailed. Market steady but weak.

Lack of a continuous stretch of cold weather has prevented operators of Kansas and Missouri from getting much beyond half time in the mines. The weather has been variable, and has not provided any great amount of business for the mines. The latter have depended chiefly on contracts from railroads and other big consumers to keep them busy, and have worked about half time without difficulty. The Pittsburg district could not have turned out more than half its capacity even if demand were strong because of an accident. Demand for domestic purposes has been light. The market has been steady and rather weak, though no pronounced change was noted in this respect.

PORTLAND, ORE.

Portland investigating the cost of fuel for bunkering purposes. Market unusually quiet as a result of the warm weather.

At its regular monthly meeting here last week the Port of Portland Commission instructed its manager, M. Talbot, to communicate with the various coal-producing districts and ascertain the cost of laying down coal in Portland. It is expected there will be a much heavier demand here upon the completion of the Panama Canal and the establishment of many new steamship lines and it is desired to be in position to furnish them with coal here as well as at other Pacific Coast ports.

So far the winter has been unusually mild here and in the entire Pacific Northwest and there has been no occasion for advanced prices. While some cold weather may be experienced, it is not likely that it will be of long duration.

PRODUCTION AND TRANSPORTATION STATISTICS

NORFOLK & WESTERN R.R.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of December, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	930,212	18,276	948,488	934,600	107,910
Tug River	220,746	3,050	223,796	162,666	61,130
Thacker	234,752	8,885	243,637	156,834	86,803
Kenova	78,518	9,199	87,717	70,043	17,674
Clinch Valley	.....	.....	.....	125,324	14,135
Other N. & W.	.....	.....	.....	36,848	.....
Total N. & W. Fields				1,486,315	287,652
Williamson and Pond Crk. RR.	.....	.....	.....	50,926	10,930
All Othe Railroadsr	.....	.....	.....	74,128	.....
Grand Total	1,464,228	39,410	1,503,638	1,611,369	298,582

Total shipments of coke, entirely from the Pocahontas field amounted to 85,846 tons.

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic from the New River, Kanawha and Kentucky districts for November and the five months ending Nov. 30, 1912 and 13, in short tons:

	November		5 Months			
Destination	1913	1912	1913	%	1912	%
Tidewater	255,344	252,447	1,313,390	17	1,466,758	22
East	248,297	311,684	1,029,925	13	963,386	14
West	289,521	731,129	4,831,363	63	4,222,603	61
Total	1,395,162	1,195,216	7,174,678		6,652,747	
From connections						
Bituminous	133,599	69,230	561,420	7	175,687	2
Anthracite	1,225	1,198	7,689		5,430	1
Total	1,529,986	1,265,688	7,743,787	100	6,833,864	100
Coke	28,535	24,216	147,818		131,392	

FOREIGN MARKETS

GREAT BRITAIN

Jan. 9—Business in large coals shows more activity, but the demand is principally confined to prompt positions. Buyers continue to hold back inquiries for ahead shipments in the hope of being able to secure easier terms. Small coals are plentiful and the tendency is irregular. Quotations are approximately as follows:

Best Welsh steam	$4.62@4.74	Best Monmouthshires	$4.26@4.32
Best seconds	4.44@4.56	Seconds	4.02@4.14
Seconds	4.32@4.44	Best Cardiff smalls	2.64@2.70
Best dry coals	4.56@4.68	Seconds	2.40@2.52

The prices for Cardiff coal are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both net, exclusive of wharfage, and for cash in 30 days.

British Exports—The following is a comparative statement of British exports for December and the 12 months of the last three years, in long tons:

	December		12 Months		
	1912	1913	1911	1912	1913
Anthracite	230,803	249,496	2,454,523	2,547,712	2,976,389
Steam	4,210,920	4,4,88444	47,119,017	46,539,374	53,619,022
Gas	829,435	980,548	10,504,172	10,559,845	11,527,586
Household	141,763	134,348	1,540,710	1,639,571	1,769,571
Other sorts	284,447	276,581	2,980,844	3,157,893	3,507,402
Total	5,697,368	6,229,453	64,599,226	64,444,395	73,400,118
Coke	97,409	118,619	1,059,876	1,059,650	1,223,936
Manufactured fuel	171,400	178,235	1,612,741	1,580,803	2,053,187
Grand total	5,966,177	6,526,307	67,271,883	67,035,848	76,687,241
Bunker coal	1,556,784	1,842,006	.....	18,291,370	21,031,507

GERMANY

The German coal production for November and the 11 months and imports and exports for November were as follows:

	Imports		Exports	
	1912	1913	1912	1913
Coal	1,002,271	910,433	2,551,839	2,879,752
Lignite	676,065	508,817	5,629	5,550
Coke	50,130	35,203	505,844	402,090
Coal briquettes	5,167	1,759	168,123	116,041
Lignite briquettes	16,276	9,483	73,885	61,140

	Production			
	November		11 Months	
	1912	1913	1912	1913
Coal	14,805,443	15,329,610	162,209,627	175,945,462
Lignite	7,558,561	7,417,859	75,218,408	79,741,825
Coke	2,598,768	2,608,370	26,435,461	29,470,168
Coal briquettes	448,329	463,573	4,870,954	5,382,167
Lignite briquettes	1,671,265	1,729,283	17,420,149	19,648,359

COAL SECURITIES

The following table gives the range of various active coal securities and dividends announced during the week ending Jan. 17.

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	.....	.....	80	84†	82†
American Coal Products Pref	106	106	106	106	106
Colorado Fuel & Iron	31¾	31	32	32¾	28½
Colorado Fuel & Iron Pref	....	....	155	....	....
Consolidation Coal of Maryland	....	....	102½	....	....
Island Creek Coal Com	48	47	48	48½	47
Island Creek Coal Pref	85	84	85	85	83½
Pittsburgh Coal	19⅜	19	19¼	19⅜	17⅞
Pittsburgh Coal Pref	88½	87	88	88½	86
Pond Creek	20⅜	19	19⅜	19⅜	18⅛
Reading	171⅛	168¾	169¾	171⅛	166⅛
Reading 1st Pref	....	....	87½	88	87½
Reading 2nd Pref	91	90½	90½	91½	90½
Virginia Iron, Coal & Coke	40	40	40	40	40

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's* Range	
Colo. F. & I. gen. s.f.g. 5s	92¼	Sale	91½	92	90	99½
Colo. F. & I. gen. 6s	104	106½	107½	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	78½	Sale	79½	79½	75	85
Cons. Ind. Coal Me. 1st 5s	76	79	76	Aug. '13	76	76
Cons. Coal 1st and ref. 5s	..	92	87¾	Dec. '13	87	87¾
Gr. Riv. Coal & C. 1st g 6s	..	..	102½	April '06	..	..
K. & H. C. & C. 1st s f g 5s	92¼	95½	92¼	Dec. '13	91	98
Pocah. Con. Coll. 1st s f 5s	..	85½	86	Oct. '13	85	87½
St. L. Rky. Mt. & Pac. 1st 5s	78	79	77	77¾	73	80½
Tenn. Coal gen. 5s	99⅜	Sale	98½	99⅜	96	103
Birm. Div. 1st consol. 6s	101½	102½	101½	Jan '14	100⅛	103
Tenn. Div. 1st g 6s	101	102½	101	Jan '14	100¼	102
Cah. C. M. Co. 1st g 6s	101	..	103	July '13	103	103
Utah Fuel 1st g 5s	..	..	....	....	..	..
Victor Fuel 1st s f 5s	..	84	80	May '13	79½	80
Va. I. Coal & Coke 1st g 5s	93½	96	94	94	92	98

*For the full year 1913. †Sale involving less than 100 shares.

DIVIDENDS

Consolidation Coal Co.—Regular quarterly dividend of 1½% payable Jan. 31 to holders of record Jan. 24.

Dominion Coal Co. Ltd.—Dividend No. 42 on the preferred of 3½% payable Feb. 2 to holders of record Jan. 17.

Pacific Coast Co.—Regular quarterly dividend of 1½% on the common and second preferred and 1¼% on the first preferred, all payable Feb. 2 to holders of record Jan. 24 to Feb. 1.